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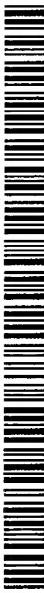
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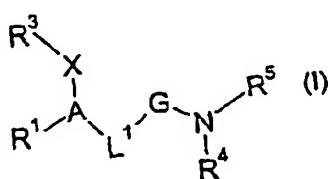
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(54) Title: AMIDE DERIVATIVES AS GK ACTIVATORS



(57) Abstract: This invention relates to compounds of the general formula (I) which are activators of glucokinase (GK), and which may be useful for the management, treatment, control, or adjunct treatment of diseases or conditions, where increasing glucokinase activity is beneficial, for example diseases such as IGT, Syndrome X, type 2 diabetes, type 1 diabetes, dyslipidemia, hyperlipidemia, hypertension, and obesity.

## AMIDE DERIVATIVES AS GK ACTIVATORS

**FIELD OF THE INVENTION**

This invention relates to compounds which are activators of glucokinase (GK), which may be useful for the management, treatment, control, or adjunct treatment of diseases,

- 5 where increasing glucokinase activity is beneficial.

**BACKGROUND OF THE INVENTION**

Diabetes is characterised by an impaired glucose metabolism manifesting itself among other things by an elevated blood glucose level in the diabetic patients. Underlying defects lead to a classification of diabetes into two major groups: Type 1 diabetes, or insulin

- 10 demanding diabetes mellitus (IDDM), which arises when patients lack  $\beta$ -cells producing insulin in their pancreatic glands, and type 2 diabetes, or non-insulin dependent diabetes mellitus (NIDDM), which occurs in patients with an impaired  $\beta$ -cell function besides a range of other abnormalities.

Type 1 diabetic patients are currently treated with insulin, while the majority of type 2 diabetic patients are treated either with sulphonylureas that stimulate  $\beta$ -cell function or with agents that enhance the tissue sensitivity of the patients towards insulin or with insulin. Among the agents applied to enhance tissue sensitivity towards insulin metformin is a representative example.

- Even though sulphonylureas are widely used in the treatment of NIDDM this therapy is, in most instances, not satisfactory: In a large number of NIDDM patients sulphonylureas do not suffice to normalise blood sugar levels and the patients are, therefore, at high risk for acquiring diabetic complications. Also, many patients gradually lose the ability to respond to treatment with sulphonylureas and are thus gradually forced into insulin treatment. This shift of patients from oral hypoglycaemic agents to insulin therapy is usually ascribed to  
25 exhaustion of the  $\beta$ -cells in NIDDM patients.

In normal subjects as well as in diabetic subjects, the liver produces glucose in order to avoid hypoglycaemia. This glucose production is derived either from the release of glucose from glycogen stores or from gluconeogenesis, which is a de novo intracellular synthesis of glucose. In type 2 diabetes, however, the regulation of hepatic glucose output is poorly controlled and is increased, and may be doubled after an overnight fast. Moreover, in these patients there exists a strong correlation between the increased fasting plasma glucose levels and the rate of hepatic glucose production. Similarly, hepatic glucose production will be increased in type 1 diabetes, if the disease is not properly controlled by insulin treatment.

Since existing forms of therapy of diabetes does not lead to sufficient glycaemic control and therefore are unsatisfactory, there is a great demand for novel therapeutic approaches.

Atherosclerosis, a disease of the arteries, is recognized to be the leading cause of death in the United States and Western Europe. The pathological sequence leading to atherosclerosis and occlusive heart disease is well known. The earliest stage in this sequence is the formation of "fatty streaks" in the carotid, coronary and cerebral arteries and in the aorta. These lesions are yellow in colour due to the presence of lipid deposits found principally within smooth-muscle cells and in macrophages of the intima layer of the arteries and aorta. Further, it is postulated that most of the cholesterol found within the fatty streaks, in turn, give rise to development of the "fibrous plaque", which consists of accumulated intimal smooth muscle cells laden with lipid and surrounded by extra-cellular lipid, collagen, elastin and proteoglycans. The cells plus matrix form a fibrous cap that covers a deeper deposit of cell debris and more extracellular lipid. The lipid is primarily free and esterified cholesterol. The fibrous plaque forms slowly, and is likely in time to become calcified and necrotic, advancing to the "complicated lesion" which accounts for the arterial occlusion and tendency toward mural thrombosis and arterial muscle spasm that characterize advanced atherosclerosis.

Epidemiological evidence has firmly established hyperlipidemia as a primary risk factor in causing cardiovascular disease (CVD) due to atherosclerosis. In recent years, leaders of the medical profession have placed renewed emphasis on lowering plasma cholesterol levels, and low density lipoprotein cholesterol in particular, as an essential step in prevention of CVD. The upper limits of "normal" are now known to be significantly lower than heretofore appreciated. As a result, large segments of Western populations are now realized to be at particular high risk. Independent risk factors include glucose intolerance, left ventricular hypertrophy, hypertension, and being of the male sex. Cardiovascular disease is especially prevalent among diabetic subjects, at least in part because of the existence of multiple independent risk factors in this population. Successful treatment of hyperlipidemia in the general population, and in diabetic subjects in particular, is therefore of exceptional medical importance.

Hypertension (or high blood pressure) is a condition, which occurs in the human population as a secondary symptom to various other disorders such as renal artery stenosis, pheochromocytoma, or endocrine disorders. However, hypertension is also evidenced in many patients in whom the causative agent or disorder is unknown. While such "essential" hypertension is often associated with disorders such as obesity, diabetes, and hypertriglyceridemia, the relationship between these disorders has not been elucidated.

Additionally, many patients display the symptoms of high blood pressure in the complete absence of any other signs of disease or disorder.

It is known that hypertension can directly lead to heart failure, renal failure, and stroke (brain haemorrhaging). These conditions are capable of causing short-term death in a patient. Hypertension can also contribute to the development of atherosclerosis and coronary disease. These conditions gradually weaken a patient and can lead to long-term death.

The exact cause of essential hypertension is unknown, though a number of factors are believed to contribute to the onset of the disease. Among such factors are stress, uncontrolled emotions, unregulated hormone release (the renin, angiotensin aldosterone system), excessive salt and water due to kidney malfunction, wall thickening and hypertrophy of the vasculature resulting in constricted blood vessels and genetic factors.

The treatment of essential hypertension has been undertaken bearing the foregoing factors in mind. Thus a broad range of beta-blockers, vasoconstrictors, angiotensin converting enzyme inhibitors and the like have been developed and marketed as antihypertensives. The treatment of hypertension utilizing these compounds has proven beneficial in the prevention of short-interval deaths such as heart failure, renal failure, and brain haemorrhaging. However, the development of atherosclerosis or heart disease due to hypertension over a long period of time remains a problem. This implies that although high blood pressure is being reduced, the underlying cause of essential hypertension is not responding to this treatment.

Hypertension has been associated with elevated blood insulin levels, a condition known as hyperinsulinemia. Insulin, a peptide hormone whose primary actions are to promote glucose utilization, protein synthesis and the formation and storage of neutral lipids, also acts to promote vascular cell growth and increase renal sodium retention, among other things. These latter functions can be accomplished without affecting glucose levels and are known causes of hypertension. Peripheral vasculature growth, for example, can cause constriction of peripheral capillaries, while sodium retention increases blood volume. Thus, the lowering of insulin levels in hyperinsulinemics can prevent abnormal vascular growth and renal sodium retention caused by high insulin levels and thereby alleviates hypertension.

Cardiac hypertrophy is a significant risk factor in the development of sudden death, myocardial infarction, and congestive heart failure. These cardiac events are due, at least in part, to increased susceptibility to myocardial injury after ischemia and reperfusion, which can occur in out-patient as well as perioperative settings. There is an unmet medical need to prevent or minimize adverse myocardial perioperative outcomes, particularly perioperative myocardial infarction. Both non-cardiac and cardiac surgery are associated with substantial risks for myocardial infarction or death. Some 7 million patients undergoing non-cardiac

- surgery are considered to be at risk, with incidences of perioperative death and serious cardiac complications as high as 20-25% in some series. In addition, of the 400,000 patients undergoing coronary by-pass surgery annually, perioperative myocardial infarction is estimated to occur in 5% and death in 1-2%. There is currently no drug therapy in this area,
- 5 which reduces damage to cardiac tissue from perioperative myocardial ischemia or enhances cardiac resistance to ischemic episodes. Such a therapy is anticipated to be life-saving and reduce hospitalizations, enhance quality of life and reduce overall health care costs of high risk patients.

Another field for the present invention is obesity or appetite regulation.

- 10 Obesity is a well-known risk factor for the development of many very common diseases such as atherosclerosis, hypertension, and diabetes. The incidence of obese people and thereby also these diseases is increasing throughout the entire industrialised world. Except for exercise, diet and food restriction no convincing pharmacological treatment for reducing body weight effectively and acceptably currently exist. However, due to its  
15 indirect but important effect as a risk factor in mortal and common diseases it will be important to find treatment for obesity and/or means of appetite regulation.

- The term obesity implies an excess of adipose tissue. In this context obesity is best viewed as any degree of excess adiposity that imparts a health risk. The cut off between normal and obese individuals can only be approximated, but the health risk imparted by the  
20 obesity is probably a continuum with increasing adiposity. The Framingham study demonstrated that a 20% excess over desirable weight clearly imparted a health risk (Mann GV N Engl J Med 291, 226 (1974)). In the United States a National Institutes of Health consensus panel on obesity agreed that a 20% increase in relative weight or a body mass index (BMI = body weight in kilograms divided by the square of the height in meters) above  
25 the 85th percentile for young adults constitutes a health risk. By the use of these criteria 20 to 30 percent of adult men and 30 to 40 percent of adult women in the United States are obese. (NIH, Ann Intern Med 103, 147 (1985)).

- Even mild obesity increases the risk for premature death, diabetes, hypertension, atherosclerosis, gallbladder disease, and certain types of cancer. In the industrialised  
30 western world the prevalence of obesity has increased significantly in the past few decades. Because of the high prevalence of obesity and its health consequences, its prevention and treatment should be a high public health priority.

- When energy intake exceeds expenditure, the excess calories are stored in adipose tissue, and if this net positive balance is prolonged, obesity results, i.e. there are two  
35 components to weight balance, and an abnormality on either side (intake or expenditure) can lead to obesity.

The regulation of eating behaviour is incompletely understood. To some extent appetite is controlled by discrete areas in the hypothalamus: a feeding centre in the ventrolateral nucleus of the hypothalamus (VLH) and a satiety centre in the ventromedial hypothalamus (VMH). The cerebral cortex receives positive signals from the feeding centre that stimulate eating, and the satiety centre modulates this process by sending inhibitory impulses to the feeding centre. Several regulatory processes may influence these hypothalamic centres. The satiety centre may be activated by the increases in plasma glucose and/or insulin that follow a meal. Meal-induced gastric distension is another possible inhibitory factor. Additionally the hypothalamic centres are sensitive to catecholamines, and beta-adrenergic stimulation inhibits eating behaviour. Ultimately, the cerebral cortex controls eating behaviour, and impulses from the feeding centre to the cerebral cortex are only one input. Psychological, social, and genetic factors also influence food intake:

At present a variety of techniques are available to effect initial weight loss. Unfortunately, initial weight loss is not an optimal therapeutic goal. Rather, the problem is that most obese patients eventually regain their weight. An effective means to establish and/or sustain weight loss is the major challenge in the treatment of obesity today.

Glucokinase (GK) plays an essential role in blood glucose homeostasis. GK catalyses glucose phosphorylation, and is the rate-limiting reaction for glycolysis in hepatocytes and pancreatic  $\beta$ -cells. In liver GK determine the rates of both glucose uptake and glycogen synthesis, and it is also thought to be essential for the regulation of various glucose-responsive genes (Girard, J. et al., *Annu Rev Nutr* 17, 325-352 (1997)). In the  $\beta$ -cells, GK determines glucose utilization and thus is necessary for glucose-stimulated insulin secretion. GK is also expressed in a population of neurones in the hypothalamus where it might be involved in feeding behaviour and in the gut where it might contribute to the secretion of enteroincretins.

GK has two main distinctive characteristics: its expression, which is limited to tissues that require glucose-sensing (mainly liver and pancreatic  $\beta$ -cells), and its  $K_m$  for glucose, which is much higher (8-12 mM) than that of the other members of the hexokinase family. Due to these kinetic characteristics, changes in serum glucose levels are paralleled by changes in glucose metabolism in liver which in turn regulate the balance between hepatic glucose output and glucose consumption.

Activators of glucokinase may thus be useful for treating diseases where increasing the activity of glucokinase is beneficial. Thus, there is a need for agents which activate glucokinase and increase glucokinase enzymatic activity. Such agents would be useful for the treatment of type I diabetes and type II diabetes.

WO 00/58293, WO 01/44216, WO/0183465, WO/0183478, WO/0185706, and WO 01/85707, to Hoffman-La Roche, disclose compounds as glucokinase activators for treatment of type 2 diabetes.

### SUMMARY OF THE INVENTION

- 5 This invention provides amide derivatives which are activators of glucokinase. The compounds of the present invention are useful as activators of glucokinase and thus are useful for the management, treatment, control and adjunct treatment of diseases where increasing the activity of glucokinase is beneficial. Such diseases include type I diabetes and type II diabetes. The present invention provides compounds as described below,
- 10 pharmaceutical compositions comprising the compounds, their use for increasing the activity of glucokinase, their use in preparation of a medicament for treating said diseases and conditions and the use of compounds or pharmaceutical preparations of the present invention for treating said diseases and conditions as well as methods for treating said diseases and conditions, which methods comprise administering to a subject in need thereof
- 15 an effective amount of a compound according to the present invention.

The present invention provides the use of a compound according to the present invention for increasing the activity of glucokinase.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for the

- 20 treatment of hyperglycemia.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of hyperglycemia.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for treatment of

- 25 IGT.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of IGT.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for the

- 30 treatment of Syndrome X.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of Syndrome X.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for the

- 35 treatment of type 2 diabetes.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of type 2 diabetes.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for the  
5 treatment of type 1 diabetes.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of type 1 diabetes.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for the  
10 treatment of dyslipidemia or hyperlipidemia.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of dyslipidemia or hyperlipidemia.

The present invention provides the use of a compound according to the present  
15 invention or a pharmaceutical composition according to the present invention for the treatment of hypertension.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment of hypertension.

The present invention provides the use of a compound according to the present  
20 invention or a pharmaceutical composition according to the present invention for lowering of food intake.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament lowering of food intake.

The present invention provides the use of a compound according to the present  
25 invention or a pharmaceutical composition according to the present invention for appetite regulation.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for appetite regulation.

The present invention provides the use of a compound according to the present  
30 invention or a pharmaceutical composition according to the present invention for the treatment or prophylaxis of obesity.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for the treatment or prophylaxis of obesity.

The present invention provides the use of a compound according to the present  
35 invention or a pharmaceutical composition according to the present invention for regulating feeding behaviour.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for regulating feeding behaviour.

The present invention provides the use of a compound according to the present invention or a pharmaceutical composition according to the present invention for enhancing the secretion of enteroincretins. In one embodiment, said enteroincretin is GLP-1.

The present invention provides the use of a compound according to the present invention for the preparation of a medicament for enhancing the secretion of enteroincretins. In one embodiment, said enteroincretin is GLP-1.

In one embodiment, use according to the present invention as described above is for a regimen, which comprises treatment with a further antidiabetic agent, such as a further antidiabetic agent selected from insulin or an insulin analogue, a sulphonylurea, a biguanide, a meglitinide, an insulin sensitizer, a thiazolidinedione insulin sensitizer, an  $\alpha$ -glucosidase inhibitor, a glycogen phosphorylase inhibitor, and an agent acting on the ATP-dependent potassium channel of the pancreatic  $\beta$ -cells.

In one embodiment, the use according to the present invention as described above is for a regimen, which comprises treatment with a further antihyperlipidemic agent, such as a further antihyperlipidemic agent selected from cholestyramine, colestipol, clofibrate, gemfibrozil, lovastatin, pravastatin, simvastatin, probucol, and dextrothyroxine.

In one embodiment, the use according to the present invention as described above is for a regimen, which comprises treatment with a further antiobesity agent.

In one embodiment, the use according to the present invention as described above is for a regimen, which comprises treatment with a further antihypertensive agent.

Other embodiments and aspects are as defined by the appended claims.

## DEFINITIONS

In the structural formulas given herein and throughout the present specification, the following terms have the indicated meaning:

The term "optionally substituted" as used herein means that the group in question is either unsubstituted or substituted with one or more of the substituents specified. When the group in question are substituted with more than one substituent the substituent may be the same or different.

The term "halogen" or "halo" means fluorine, chlorine, bromine or iodine.

The term "perhalomethyl" means trifluoromethyl, trichloromethyl, tribromomethyl, or triiodomethyl.

The use of prefixes of this structure: C<sub>x-y</sub>-alkyl, C<sub>x-y</sub>-alkenyl, C<sub>x-y</sub>-alkynyl, C<sub>x-y</sub>-cycloalkyl or C<sub>x-y</sub>-cycloalkyl-C<sub>x-y</sub>-alkenyl designates radical of the designated type having from x to y carbon atoms.

- The term "alkyl" as used herein, alone or in combination, refers to a straight or  
5 branched chain saturated monovalent hydrocarbon radical having from one to ten carbon atoms, for example C<sub>1-8</sub>-alkyl. Typical C<sub>1-8</sub>-alkyl groups include, but are not limited to e.g. methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, n-pentyl, 2-methylbutyl, 3-methylbutyl, 4-methylpentyl, neopentyl, n-pentyl, n-hexyl, 1,2-dimethylpropyl, 2,2-dimethylpropyl, 1,2,2-trimethylpropyl and the like. The term "C<sub>1-8</sub>-alkyl" as used herein  
10 also includes secondary C<sub>3-8</sub>-alkyl and tertiary C<sub>4-8</sub>-alkyl.

The term "alkylene" as used herein, alone or in combination, refers to a straight or branched chain saturated divalent hydrocarbon radical having from one to ten carbon atoms, for example C<sub>1-8</sub>-alkylene. Examples of "alkylene" as used herein include, but are not limited to, methylene, ethylene, and the like.

- 15 The term "alkenyl" as used herein, alone or in combination, refers to a straight or branched chain monovalent hydrocarbon radical containing from two to ten carbon atoms and at least one carbon-carbon double bond, for example C<sub>2-8</sub>-alkenyl. Typical C<sub>2-8</sub>-alkenyl groups include, but are not limited to, vinyl, 1-propenyl, 2-propenyl, iso-propenyl, 1,3-butadienyl, 1-butenyl, 2-butenyl, 3-butenyl, 2-methyl-1-propenyl, 1-pentenyl, 2-pentenyl, 3-pentenyl, 4-pentenyl, 3-methyl-2-butenyl, 1-hexenyl, 2-hexenyl, 3-hexenyl, 2,4-hexadienyl, 5-hexenyl and the like.

- 20 The term "alkenylene" as used herein, alone or in combination, refers to a straight or branched chain divalent hydrocarbon radical having from two to ten carbon atoms and at least one carbon-carbon double bond, for example C<sub>(2-8)</sub>-alkenylene. Typical C<sub>(2-8)</sub>-alkenylene groups include, but are not limited to, ethene-1,2-diyl, propene-1,3-diyl, methylene-1,1-diyl, and the like.

- 25 The term "alkynyl" as used herein alone or in combination, refers to a straight or branched hydrocarbon group containing from 2 to the specified number of carbon atoms and at least one triple carbon-carbon bond, for example C<sub>2-8</sub>-alkynyl. Typical C<sub>2-8</sub>-alkynyl groups include, but are not limited to, ethynyl, 1-propynyl, 2-propynyl, 1-butynyl, 2-butynyl, 3-butynyl, 1-pentynyl, 2-pentynyl, 3-pentynyl, 4-pentynyl, 1-hexynyl, 2-hexynyl, 3-hexynyl, 5-hexynyl, 2,4-hexadiynyl and the like.

- 30 The term "alkynylene" as used herein alone or in combination, refers to a straight or branched chain divalent hydrocarbon radical having from two to ten carbon atoms and at least one carbon-carbon triple bond, for example C<sub>2-8</sub>-alkynylene. Typical C<sub>2-8</sub>-alkynylene groups include, but are not limited to, ethyne-1,2-diyl, propyne-1,3-diyl, and the like.

The term "cycloalkyl" as used herein, alone or in combination, refers to a non-aromatic carbocyclic monovalent hydrocarbon radical having from three to twelve carbon atoms, and optionally with one or more degrees of unsaturation, for example C<sub>3-8</sub>-cycloalkyl. Such a ring may be optionally fused to one or more benzene rings or to one or more of other cycloalkyl ring(s). Typical C<sub>3-8</sub>-cycloalkyl groups include, but are not limited to, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl and the like.

The term "cycloalkylene" as used herein, alone or in combination, refers to a non-aromatic carbocyclic divalent hydrocarbon radical having from three to twelve carbon atoms and optionally possessing one or more degrees of unsaturation, for example C<sub>3-8</sub>-cycloalkylene. Such a ring may be optionally fused to one or more benzene rings or to one or more of other cycloalkyl ring(s). Typical C<sub>3-8</sub>-cycloalkylene groups include, but are not limited to, cyclopropyl-1,1-diyl, cyclopropyl-1,2-diyl, cyclobutyl-1,2-diyl, cyclopentyl-1,3-diyl, cyclohexyl-1,4-diyl, cycloheptyl-1,4-diyl, or cyclooctyl-1,5-diyl, and the like.

The term "heterocyclic" or the term "heterocyclyl" as used herein, alone or in combination, refers to a three to twelve membered heterocyclic ring having one or more degrees of unsaturation containing one or more heteroatomic substitutions selected from S, SO, SO<sub>2</sub>, O, or N, for example C<sub>3-8</sub>-heterocyclyl. Such a ring may be optionally fused to one or more of another "heterocyclic" ring(s) or cycloalkyl ring(s). Typical C<sub>3-8</sub>-heterocyclyl groups include, but are not limited to, tetrahydrofuran, 1,4-dioxane, 1,3-dioxane, piperidine, pyrrolidine, morpholine, piperazine, and the like.

The term "heterocyclylene" as used herein, alone or in combination, refers to a three to twelve-membered heterocyclic ring diradical optionally having one or more degrees of unsaturation containing one or more heteroatoms selected from S, SO, SO<sub>2</sub>, O, or N. Such a ring may be optionally fused to one or more benzene rings or to one or more of another "heterocyclic" rings or cycloalkyl rings. Examples of "heterocyclylene" include, but are not limited to, tetrahydrofuran-2,5-diyl, morpholine-2,3-diyl, pyran-2,4-diyl, 1,4-dioxane-2,3-diyl, 1,3-dioxane-2,4-diyl, piperidine-2,4-diyl, piperidine-1,4-diyl, pyrrolidine-1,3-diyl, morpholine-2,4-diyl, piperazine-1,4-diyl, and the like.

The term "alkoxy" as used herein, alone or in combination, refers to the monovalent radical R<sup>a</sup>O-, where R<sup>a</sup> is alkyl as defined above, for example C<sub>(1-8)</sub>-alkyl giving C<sub>(1-8)</sub>-alkoxy. Typical C<sub>(1-8)</sub>-alkoxy groups include, but are not limited to, methoxy, ethoxy, n-propoxy, isopropoxy, butoxy, sec-butoxy, tert-butoxy, pentoxy, isopentoxy, hexoxy, isoheoxy and the like.

The term "alkylthio" as used herein, alone or in combination, refers to a straight or branched monovalent radical comprising an alkyl group as described above linked through a divalent sulphur atom having its free valence bond from the sulphur atom, for example C<sub>1-8</sub>-

alkylthio. Typical C<sub>1-8</sub>-alkylthio groups include, but are not limited to, methylthio, ethylthio, propylthio, butylthio, pentylthio, hexylthio and the like.

The term "alkoxycarbonyl" as used herein refers to the monovalent radical R<sup>a</sup>OC(O)-, where R<sup>a</sup> is alkyl as described above, for example C<sub>1-8</sub>-alkoxycarbonyl. Typical C<sub>1-8</sub>-alkoxycarbonyl groups include, but are not limited to, methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxycarbonyl, n-butoxycarbonyl, sec-butoxycarbonyl, tertbutoxycarbonyl, 3-methylbutoxycarbonyl, n-hexoxycarbonyl and the like.

The term "carbamoyl" as used herein refers to NH<sub>2</sub>C(O)-.

The term "aryl" as used herein refers to a carbocyclic aromatic ring radical with for instance 6 to 8 member atoms, or to an aromatic ring system radical with for instance from 10 12 to 18 member atoms. Aryl is also intended to include the partially hydrogenated derivatives of the carbocyclic systems.

The term "heteroaryl", as used herein, alone or in combination, refers to an aromatic ring radical with for instance 5 to 7 member atoms, or to an aromatic ring system radical with for instance from 15 7 to 18 member atoms, containing one or more heteroatoms selected from nitrogen, oxygen, or sulfur heteroatoms, wherein N-oxides and sulfur monoxides and sulfur dioxides are permissible heteroaromatic substitutions; such as e.g. furanyl, thienyl, thiophenyl, pyrrolyl, imidazolyl, pyrazolyl, triazolyl, tetrazolyl, thiazolyl, oxazolyl, isoxazolyl, oxadiazolyl, thiadiazolyl, isothiazolyl, pyridinyl, pyridazinyl, pyrazinyl, pyrimidinyl, quinolinyl, isoquinolinyl, benzofuranyl, benzothiophenyl, indolyl, and indazolyl, and the like. Heteroaryl is also intended to include the partially hydrogenated derivatives of the heterocyclic systems enumerated below.

Examples of "aryl" and "heteroaryl" includes, but are not limited to phenyl, biphenyl, indene, fluorene, naphthyl (1-naphthyl, 2-naphthyl), anthracene (1-anthracyl, 2-anthracyl, 3-anthracyl), thiophene (2-thienyl, 3-thienyl), furyl (2-furyl, 3-furyl), indolyl, oxadiazolyl, isoxazolyl, thiadiazolyl, oxatriazolyl, thiatriazolyl, quinazolin, fluorenlyl, xanthenyl, isoindanyl, benzhydryl, acridinyl, thiazolyl, pyrrolyl (1-pyrrolyl, 2-pyrrolyl, 3-pyrrolyl), pyrazolyl (1-pyrazolyl, 3-pyrazolyl, 4-pyrazolyl, 5-pyrazolyl), imidazolyl (1-imidazolyl, 2-imidazolyl, 4-imidazolyl, 5-imidazolyl), triazolyl (1,2,3-triazol-1-yl, 1,2,3-triazol-4-yl, 1,2,3-triazol-5-yl, 1,2,4-triazol-3-yl, 1,2,4-triazol-5-yl), oxazolyl (2-oxazolyl, 4-oxazolyl, 5-oxazolyl), isooxazolyl (isooxazo-3-yl, isooxazo-4-yl, isooxaz-5-yl), isothiazolyl (isothiazo-3-yl, isothiazo-4-yl, isothiaz-5-yl) thiazolyl (2-thiazolyl, 4-thiazolyl, 5-thiazolyl), pyridyl (2-pyridyl, 3-pyridyl, 4-pyridyl), pyrimidinyl (2-pyrimidinyl, 4-pyrimidinyl, 5-pyrimidinyl, 6-pyrimidinyl), pyrazinyl, pyridazinyl (3-pyridazinyl, 4-pyridazinyl, 5-pyridazinyl), quinolyl (2-quinolyl, 3-quinolyl, 4-quinolyl, 5-quinolyl, 6-quinolyl, 7-quinolyl, 8-quinolyl), isoquinolyl (1-isoquinolyl, 3-isoquinolyl, 4-isoquinolyl, 5-isoquinolyl, 6-isoquinolyl, 7-isoquinolyl, 8-isoquinolyl), benzo[b]furanyl (2-

- benzo[b]furanyl, 3-benzo[b]furanyl, 4-benzo[b]furanyl, 5-benzo[b]furanyl, 6-benzo[b]furanyl, 7-benzo[b]furanyl), 2,3-dihydro-benzo[b]furanyl (2-(2,3-dihydro-benzo[b]furanyl), 3-(2,3-dihydro-benzo[b]furanyl), 4-(2,3-dihydro-benzo[b]furanyl), 5-(2,3-dihydro-benzo[b]furanyl), 6-(2,3-dihydro-benzo[b]furanyl), 7-(2,3-dihydro-benzo[b]furanyl)), benzo[b]thiophenyl
- 5 (benzo[b]thiophen-2-yl, benzo[b]thiophen-3-yl, benzo[b]thiophen-4-yl, benzo[b]thiophen-5-yl, benzo[b]thiophen-6-yl, benzo[b]thiophen-7-yl), 2,3-dihydro-benzo[b]thiophenyl (2,3-dihydro-benzo[b]thiophen-2-yl, 2,3-dihydro-benzo[b]thiophen-3-yl, 2,3-dihydro-benzo[b]thiophen-4-yl, 2,3-dihydro-benzo[b]thiophen-5-yl, 2,3-dihydro-benzo[b]thiophen-6-yl, 2,3-dihydro-benzo[b]thiophen-7-yl), indolyl (1-indolyl, 2-indolyl, 3-indolyl, 4-indolyl, 5-indolyl, 6-indolyl, 7-indolyl), indazole (1-indazolyl, 3-indazolyl, 4-indazolyl, 5-indazolyl, 6-indazolyl, 7-indazolyl), benzimidazolyl (1-benzimidazolyl, 2-benzimidazolyl, 4-benzimidazolyl, 5-benzimidazolyl, 6-benzimidazolyl, 7-benzimidazolyl, 8-benzimidazolyl), benzoxazolyl (2-benzoxazolyl, 3-benzoxazolyl, 4-benzoxazolyl, 5-benzoxazolyl, 6-benzoxazolyl, 7-benzoxazolyl), benzothiazolyl (2-benzothiazolyl, 4-benzothiazolyl, 5-benzothiazolyl, 6-benzothiazolyl, 7-benzothiazolyl), carbazolyl (1-carbazolyl, 2-carbazolyl, 3-carbazolyl, 4-carbazolyl), 5H-dibenz[b,f]azepine (5H-dibenz[b,f]azepin-1-yl, 5H-dibenz[b,f]azepine-2-yl, 5H-dibenz[b,f]azepine-3-yl, 5H-dibenz[b,f]azepine-4-yl, 5H-dibenz[b,f]azepine-5-yl), 10,11-dihydro-5H-dibenz[b,f]azepine (10,11-dihydro-5H-dibenz[b,f]azepine-1-yl, 10,11-dihydro-5H-dibenz[b,f]azepine-2-yl, 10,11-dihydro-5H-dibenz[b,f]azepine-3-yl, 10,11-dihydro-5H-
- 10 dibenz[b,f]azepine-4-yl, 10,11-dihydro-5H-dibenz[b,f]azepine-5-yl), benzo[1,3]dioxole (2-benzo[1,3]dioxole, 4-benzo[1,3]dioxole, 5-benzo[1,3]dioxole, 6-benzo[1,3]dioxole, 7-benzo[1,3]dioxole), and tetrazolyl (5-tetrazolyl, N-tetrazolyl).
- 15 The present invention also relates to partly or fully saturated analogues of the ring systems mentioned above.

20 As used herein, the term "fused arylheterocyclyl" refers to an aryl group fused to a heterocyclyl group, the two having two atoms in common, and wherein the aryl group is the point of substitution. Examples of "fused arylheterocyclyl" used herein include 4-(2,3-benzo-dioxin), 3,4-methylenedioxy-1-phenyl, and the like.

25 As used herein, the term "fused heterocyclaryl" refers to a heterocyclyl group fused to an aryl group, the two having two atoms in common, and wherein the heterocyclyl group is the point of substitution. Examples of "fused heterocyclaryl" used herein include 2-(1,3-benzodioxole and the like.

30 As used herein, the term "fused heteroarylheterocyclyl" refers to a heteroaryl group fused to an heterocyclyl group, the two having two atoms in common, and wherein the heteroaryl group is the point of substitution. Examples of "fused heteroarylheterocyclyl" used herein include 1,2,3,4-tetrahydro-beta-carboline and the like.

As used herein, the term "fused heterocycliheteroaryl" refers to a heterocycl group fused to an heteroaryl group, the two having two atoms in common, and wherein the heterocycl group is the point of substitution. Examples of "fused heterocycliheteroaryl" used herein include 2-[1,3]-dioxolo[4,5-c]pyridine and the like.

5 As used herein, the term "fused arylcycloalkyl" refers to a aryl group fused to a cycloalkyl group, the two having two atoms in common, and wherein the aryl group is the point of substitution. Examples of "fused cycloalkylaryl" used herein include 5-indanyl, 6-(1,2,3,4-tetrahydronaphthyl), and the like.

10 As used herein, the term "fused cycloalkylaryl" refers to a cycloalkyl group fused to an aryl group, the two having two atoms in common, and wherein the cycloalkyl group is the point of substitution Examples of "fused cycloalkylaryl" used herein include 1-indanyl, 2-indanyl, 1-(1,2,3,4-tetrahydronaphthyl), and the like.

15 As used herein, the term "fused heteroarylcycloalkyl" refers to a heteroaryl group fused to an cycloalkyl group, the two having two atoms in common, and wherein the heteroaryl group is the point of substitution. Examples of "fused heteroarylcycloalkyl" used herein include 5-aza-6-indanyl and the like.

20 As used herein, the term "fused cycloalkylheteroaryl" refers to a cycloalkyl group fused to an heteroaryl group, the two having two atoms in common, and wherein the cycloalkyl group is the point of substitution. Examples of "fused cycloalkylheteroaryl" used herein include 5-aza-1-indanyl and the like.

The term "arylene", as used herein, alone or in combination, refers to carbocyclic aromatic ring diradical or to a aromatic ring system diradical. Examples of "arylene" include, but are not limited to, benzene-1,4-diyl, naphthalene-1,8-diyl, and the like.

25 The term "heteroarylene", as used herein, alone or in combination, refers to a five to seven membered aromatic ring diradical, or to a aromatic ring system diradical, containing one or more heteroatoms selected from nitrogen, oxygen, or sulfur heteroatoms, wherein N-oxides and sulfur monoxides and sulfur dioxides are permissible heteroaromatic substitutions. Examples of "heteroarylene" used herein are furan-2,5-diyl, thiophene-2,4-diyl, 1,3,4-oxadiazole-2,5-diyl, 1,3,4-thiadiazole-2,5-diyl, 1,3-thiazole-2,4-diyl, 1,3-thiazole-2,5-diyl, 30 pyridine-2,4-diyl, pyridine-2,3-diyl, pyridine-2,5-diyl, pyrimidine-2,4-diyl, quinoline-2,3-diyl, and the like.

The term "alkylsulfanyl", as used herein, refers to the group  $R^aS-$ , where  $R^a$  is alkyl as described above.

35 The term "alkylsulfenyl", as used herein, refers to the group  $R^aS(O)-$ , where  $R^a$  is alkyl as described above.

The term "alkylsulfonyl", as used herein, refers to the group  $R^aSO_2^-$ , where  $R^a$  is alkyl as described above.

The term "acyl", as used herein, refers to the group  $R^aC(O)-$ , where  $R^a$  is alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, or heterocyclyl as described above.

5 The term "aroyl", as used herein, refers to the group  $R^aC(O)-$ , where  $R^a$  is aryl as described above.

The term "heteroaroyl", as used herein, refers to the group  $R_aC(O)-$ , where  $R^a$  is heteroaryl as described above.

10 The term "acyloxy", as used herein, refers to the group  $R^aC(O)O-$ , where  $R^a$  is alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, or heterocyclyl as described above.

The term "aroxy", as used herein, refers to the group  $R^aC(O)O-$ , where  $R^a$  is aryl as described above.

The term "heteroaroxy", as used herein, refers to the group  $R^aC(O)O-$ , where  $R^a$  is heteroaryl as described above.

15 Whenever the terms "alkyl" or "aryl" or either of their prefix roots appear in a name of a substituent (e.g. arylalkoxyaryloxy) they shall be interpreted as including those limitations given above for "alkyl" and "aryl".

As used herein, the term "oxo" shall refer to the substituent =O.

As used herein, the term "mercapto" shall refer to the substituent -SH.

20 As used herein, the term "carboxy" shall refer to the substituent -COOH.

As used herein, the term "cyano" shall refer to the substituent -CN.

As used herein, the term "aminosulfonyl" shall refer to the substituent - $SO_2NH_2$ .

As used herein, the term "sulfanyl" shall refer to the substituent -S-.

As used herein, the term "sulfenyl" shall refer to the substituent -S(O)-.

25 As used herein, the term "sulfonyl" shall refer to the substituent -S(O)<sub>2</sub>-.

As used herein, the term "direct bond", where part of a structural variable specification, refers to the direct joining of the substituents flanking (preceding and succeeding) the variable taken as a "direct bond".

30 The term "lower", as used herein, refers to a group having between one and six carbons, and may be indicated with the prefix  $C_{x-y}$ . Lower alkyl may thus be indicated as  $C_{1-6}$ -alkyl, while lower alkylene may be indicated as  $C_{2-6}$ -alkylene.

A radical such as  $C_{x-y}$ -cycloalkyl- $C_{a-b}$ -alkenyl shall designate that the radical's point of attachment is in part of the radical mentioned last.

35 As used herein, the term "optionally" means that the subsequently described event(s) may or may not occur, and includes both event(s) which occur and events that do not occur.

As used herein, the term "substituted" refers to substitution with the named substituent or substituents, multiple degrees of substitution being allowed unless otherwise stated.

- As used herein, the terms "contain" or "containing" can refer to in-line substitutions
- 5 at any position along the above defined alkyl, alkenyl, alkynyl or cycloalkyl substituents with one or more of any of O, S, SO, SO<sub>2</sub>, N, or N-alkyl, including, for example, -CH<sub>2</sub>-O-CH<sub>2</sub>-, -CH<sub>2</sub>-SO<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-NH-CH<sub>3</sub> and so forth.

Certain of the above defined terms may occur more than once in the structural formulae, and upon such occurrence each term shall be defined independently of the other.

- 10 As used herein, the term "solvate" is a complex of variable stoichiometry formed by a solute (in this invention, a compound of formula (I), (II), or (III)) and a solvent. Such solvents for the purpose of the present invention may not interfere with the biological activity of the solute. Solvents may be, by way of example, water, ethanol, or acetic acid.

- As used herein, the term "biohydrolyzable ester" is an ester of a drug substance (in
- 15 this invention, a compound of formula (I), (II), or (III)) which either a) does not interfere with the biological activity of the parent substance but confers on that substance advantageous properties *in vivo* such as duration of action, onset of action, and the like, or b) is biologically inactive but is readily converted *in vivo* by the subject to the biologically active principle. The advantage is that, for example, the biohydrolyzable ester is orally absorbed from the gut and
- 20 is transformed to (I) in plasma. Many examples of such are known in the art and include by way of example lower alkyl esters (e.g., C<sub>1</sub>-C<sub>4</sub>), lower acyloxyalkyl esters, lower alkoxyacyloxyalkyl esters, alkoxyacyloxy esters, alkyl acylamino alkyl esters, and choline esters.

- As used herein, the term "biohydrolyzable amide" is an amide of a drug substance (in this invention, a compound of general formula (I), (II), or (III)) which either a) does not interfere with the biological activity of the parent substance but confers on that substance advantageous properties *in vivo* such as duration of action, onset of action, and the like, or b) is biologically inactive but is readily converted *in vivo* by the subject to the biologically active principle. The advantage is that, for example, the biohydrolyzable amide is orally absorbed from the gut and is transformed to (I) in plasma. Many examples of such are known in the art and include by way of example lower alkyl amides,  $\alpha$ -amino acid amides, alkoxyacyl amides, and alkylaminoalkylcarbonyl amides.

- As used herein, the term "prodrug" includes biohydrolyzable amides and biohydrolyzable esters and also encompasses a) compounds in which the biohydrolyzable functionality in such a prodrug is encompassed in the compound of formula (I): for example, the lactam formed by a carboxylic group in R<sup>2</sup> and an amine in R<sup>4</sup>, and b) compounds which

may be oxidized or reduced biologically at a given functional group to yield drug substances of formula (I). Examples of these functional groups include, but are not limited to, 1,4-dihydropyridine, N-alkylcarbonyl-1,4-dihydropyridine, 1,4-cyclohexadiene, tert-butyl, and the like.

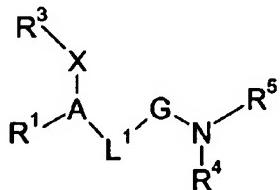
- 5 The term "pharmacologically effective amount" or shall mean that amount of a drug  
or pharmaceutical agent that will elicit the biological or medical response of a tissue, animal  
or human that is being sought by a researcher or clinician. This amount can be a  
therapeutically effective amount. The term "therapeutically effective amount" shall mean that  
amount of a drug or pharmaceutical agent that will elicit the therapeutic response of an  
10 animal or human that is being sought.

The term "treatment" and "treating" as used herein means the management and care of a patient for the purpose of combating a disease, disorder or condition. The term is intended to include the full spectrum of treatments for a given disorder from which the patient is suffering, such as the delaying of the progression of the disease, disorder or condition, the alleviation or relief of symptoms and complications, and/or the cure or elimination of the disease, disorder or condition. The patient to be treated is preferably a mammal, in particular a human being.

## **DETAILED DESCRIPTION OF THE INVENTION**

- In one embodiment, the present invention provides carboxamide or sulfonamide activator of glucokinase having a heteroatom in the alpha, beta, or gamma position relative to the carboxamide or sulfonamide, respectively.

In one embodiment, the present invention provides compounds of the general formula (I)



(1)

wherein

**G** is  $-S(O_2)-$ , or  $-C(O)-$ ;

A is >N-, and

X is a direct bond, -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>6</sup>)-, wherein

- 30 R<sup>6</sup> is hydrogen or alkyl, which may optionally be substituted with one or more substituents R<sup>16</sup>, R<sup>17</sup>, and R<sup>18</sup>, and

L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>-C(R<sup>9</sup>)(R<sup>10</sup>)<sub>m</sub>-Y-, or a direct bond, wherein

n is an integer of from 1 to 6,

R<sup>9</sup> and R<sup>10</sup> independently of each other are selected from alkyl, or

cycloalkyl, optionally substituted by one or more substituents R<sup>19</sup>, R<sup>20</sup>, and

R<sup>21</sup>; or from aryl optionally substituted by one or more substituents R<sup>40</sup>, R<sup>41</sup>,

R<sup>42</sup>, and R<sup>43</sup>,

m is an integer of 0 to 1, and

Y is a direct bond, -O- or -N(R<sup>7</sup>)-, wherein

R<sup>7</sup> is hydrogen or alkyl, which may optionally be substituted with

one or more substituents R<sup>22</sup>, R<sup>23</sup>, and R<sup>24</sup>;

or

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>,

R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein

R<sup>8</sup> is hydrogen or alkyl, which may optionally be substituted with one or

more substituents R<sup>28</sup>, R<sup>29</sup>, and R<sup>30</sup>;

or

A is >C(R<sup>2</sup>)-, wherein R<sup>2</sup> is hydrogen or alkyl, optionally substituted with one or more

substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>, and

X is -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is as defined above, and

L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>-Y-, or a direct bond, wherein

n is an integer of from 1 to 6, and

Y is a direct bond, O, or -N(R<sup>7</sup>)-, wherein

R<sup>7</sup> is as defined above;

or

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>,

R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein

R<sup>8</sup> is as defined above;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl,

and heterocycl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or

from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylhetereocycl, fused heterocycl-

heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylcyloalkyl, and fused

cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and

R<sup>47</sup>;

or

R<sup>1</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or

5 more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or, when A is >C(R<sup>2</sup>)-, then

R<sup>1</sup> and R<sup>2</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally

10 substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>2</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally

15 substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

R<sup>4</sup> is hydrogen or alkyl, optionally substituted with one or more substituents R<sup>37</sup>, R<sup>38</sup>, and R<sup>39</sup>; and

R<sup>5</sup> is aryl or heteroaryl, optionally substituted with one or more substituents R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup>;

20 wherein

R<sup>16</sup>, R<sup>17</sup>, R<sup>18</sup>, R<sup>19</sup>, R<sup>20</sup>, R<sup>21</sup>, R<sup>22</sup>, R<sup>23</sup>, R<sup>24</sup>; R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup> R<sup>28</sup>, R<sup>29</sup>, R<sup>30</sup>; R<sup>31</sup>, R<sup>32</sup>, R<sup>33</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>37</sup>, R<sup>38</sup>, and R<sup>39</sup> independently of each other are selected from

-CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCF<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>,

-NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>,

25 -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>,

-OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

30 C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cyclo-

alkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio,

C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl,

C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, heterocyclyl-C<sub>1-6</sub>-alkyl,

heterocyclyl-C<sub>2-6</sub>-alkenyl, heterocyclyl-C<sub>2-6</sub>-alkynyl, aryl, aryloxy, aryloxycarbonyl,

aryl, aryl-C<sub>1-6</sub>-alkoxy, aryl-C<sub>1-6</sub>-alkyl, aryl-C<sub>2-6</sub>-alkenyl, aryl-C<sub>2-6</sub>-alkynyl, heteroaryl,

35 heteroaryl-C<sub>1-6</sub>-alkyl, heteroaryl-C<sub>2-6</sub>-alkenyl and heteroaryl-C<sub>2-6</sub>-alkynyl, of which the

aryl and heteroaryl moieties optionally may be substituted with one or more

substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

R<sup>40</sup>, R<sup>41</sup>, R<sup>42</sup>, R<sup>43</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> independently of each other are selected from halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, 5 -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>;

10 C<sub>1-6</sub>-alkyl, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;

15 C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, heterocyclyl-C<sub>1-6</sub>-alkyl, heterocyclyl-C<sub>2-6</sub>-alkenyl, heterocyclyl-C<sub>2-6</sub>-alkynyl, aryl, aryloxy, aryloxycarbonyl, aroyl, aryl-C<sub>1-6</sub>-alkoxy, aryl-C<sub>1-6</sub>-alkyl, aryl-C<sub>2-6</sub>-alkenyl, aryl-C<sub>2-6</sub>-alkynyl, heteroaryl, heteroaryl-C<sub>1-6</sub>-alkyl, heteroaryl-C<sub>2-6</sub>-alkenyl and heteroaryl-C<sub>2-6</sub>-alkynyl, of which the aryl and heteroaryl optionally may be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;

20 and  
two of R<sup>40</sup>, R<sup>41</sup>, R<sup>42</sup>, and R<sup>43</sup>, or two of R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> on adjacent carbon atoms may independently be taken together to form -O-CH<sub>2</sub>-O-, wherein

25 R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, aryl-C<sub>1-6</sub>-alkyl or aryl;

or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds; and

30 R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> independently of each other are selected from halogen, perfluoroalkyl, cyano, alkyl-Z-, aryl-Z-, aryl-alkylene-Z-, N(R<sup>63</sup>)(R<sup>64</sup>)-alkylene-Z-; and R<sup>65</sup>-W-alkylene-Z-; wherein

35 Z and W independently of each other are selected from a direct bond, alkylene, -O-, -N(R<sup>66</sup>)-, -S-, -SO<sub>2</sub>-, -C(O)N(R<sup>66</sup>)-, -N(R<sup>68</sup>)C(O)-, -

20

$N(R^{68})C(O)N(R^{67})-$ ,  $-N(R^{66})SO_2-$ ,  $-SO_2N(R^{66})-$ ,  $-C(O)C-$ ,  $-OC(O)-$ , and  
 $-N(R^{66})SO_2N(R^{67})-$ ; wherein

$R^{66}$  and  $R^{67}$  independently of each other are hydrogen or alkyl;

$R^{63}$ ,  $R^{64}$ , and  $R^{65}$  are selected from the group consisting of hydrogen, aryl, alkyl, and aryl-alkylene-; or

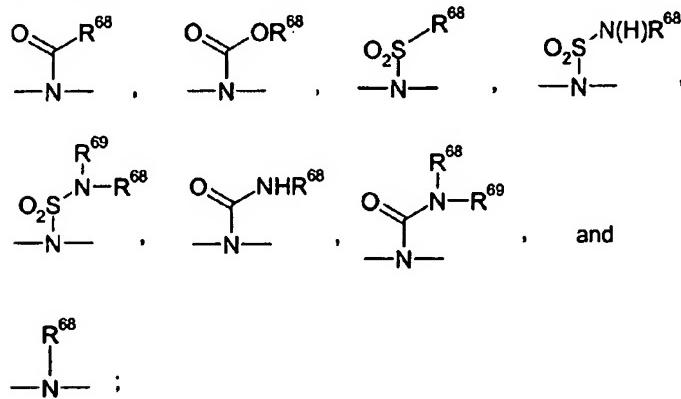
$R^{63}$  and  $R^{64}$  may be taken together to form a ring having the formula  
 $-(CH_2)_j-E-(CH_2)_k-$  bonded to the nitrogen atom to which  $R^{63}$  and  $R^{64}$  are attached, wherein

$j$  is an integer of from 1 to 4;

10

$k$  is an integer of from 1 to 4; and

$E$  is a direct bond,  $-CH_2-$ ,  $-O-$ ,  $-S-$ ,  $-S(O_2)-$ ,  $-C(O)-$ ,  $-C(O)N(H)-$ ,  
 $-NHC(O)-$ ,  $-NHC(O)N(H)-$ ,  $-NHSO_2-$ ,  $-SO_2NH-$ ,  $-C(O)O-$ ,  $-OC(O)-$ ,  
 $-NHSO_2NH-$ ,



15

wherein

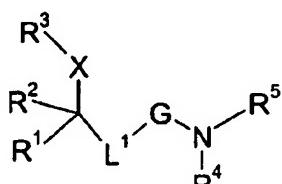
$R^{68}$  and  $R^{69}$  are selected from the group consisting of hydrogen, aryl, alkyl, and aryl-alkylene-;

or a pharmaceutically acceptable salt, solvate or prodrug thereof.

20

In one embodiment, the present invention provides compounds of the general

formula (II)



(II)

wherein

$G$  is  $-S(O_2)-$ , or  $-C(O)-$ ;

$R^2$  is hydrogen or alkyl, which may optionally be substituted with one or more substituents  $R^{31}$ ,  $R^{32}$ , and  $R^{33}$ ;

$X$  is  $-O-$ ,  $-S-$ ,  $-S(O)-$ ,  $-S(O_2)-$ , or  $-N(R^6)-$ , wherein

$R^6$  is as described above;

5  $L^1$  is  $-(CH_2)_n-Y-$ , or a direct bond, wherein

$n$  is an integer of from 1 to 6,

$Y$  is a direct bond, O, or  $-N(R^7)-$ , wherein

$R^7$  is as described above;

$R^1$  and  $R^3$  independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl,

10 and heterocyclyl, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ ; or from aryl, heteroaryl, fused heterocyclaryl, fused heteroaryl/heterocyclyl, fused heterocyclyl-heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroaryl/cycloalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ ;

15 or

$R^1$  and  $R^2$  may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ ;

20  $R^4$  is as described above; and

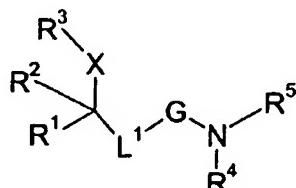
$R^5$  is as described above;

wherein  $R^{31}$ ,  $R^{32}$ ,  $R^{33}$ ,  $R^{34}$ ,  $R^{35}$ ,  $R^{36}$ ,  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as described above,

or a pharmaceutically acceptable salt, solvate or prodrug thereof.

In one embodiment, the present invention provides compounds of the general

25 formula (II)



(II)

wherein

$G$  is  $-S(O_2)-$ , or  $-C(O)-$ , and

30  $X$  is  $-O-$ ,  $-S-$ ,  $-S(O)-$ ,  $-S(O_2)-$ , or  $-N(R^6)-$ , wherein

$R^6$  is as described above, and

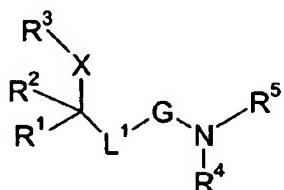
$L^1$  is  $-(CH_2)_n-Y-$ , or a direct bond, wherein

n is an integer of from 1 to 6, and  
 Y is a direct bond, O, or -N(R<sup>7</sup>)-, wherein  
 R<sup>7</sup> is as described above;

or

- 5 X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and  
 L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein  
 R<sup>8</sup> is as described above;
- 10 R<sup>1</sup> is selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or from aryl, heteroaryl, fused heterocyclyl-aryl, fused heteroarylheterocyclyl, fused heterocyclylheteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylcy cloalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;
- 15 R<sup>2</sup> and R<sup>3</sup> are taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;
- 20 R<sup>4</sup> is as described above; and  
 R<sup>5</sup> is as described above;
- 20 wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as described above; or a pharmaceutically acceptable salt, solvate or prodrug thereof.

In one embodiment, the present invention provides compounds of the general formula (II)



(II)

wherein

G is -S(O<sub>2</sub>)-, or -C(O)-;

R<sup>2</sup> is hydrogen or alkyl, which may optionally be substituted with one or more substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>;

- 30 X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>, or a direct bond;

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein R<sup>8</sup> is as described above;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocycll, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylheterocycll, fused heterocyclheteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroaryl(cycloalkyl, and fused

5 cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>1</sup> and R<sup>2</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocycll ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>,

10 and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>2</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocycll ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>,

15 and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

R<sup>4</sup> is as described above; and

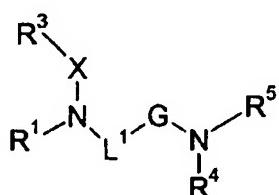
R<sup>5</sup> is as described above;

wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup>, R<sup>31</sup>, R<sup>32</sup>, R<sup>33</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as described

20 above;

or a pharmaceutically acceptable salt, solvate or prodrug thereof.

In one embodiment, the present invention provides compounds of the general formula (III)



(III)

wherein

G is -S(O<sub>2</sub>)-, or -C(O)-; and

X is a direct bond, -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is as described above, and

30 L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>- C(R<sup>9</sup>)(R<sup>10</sup>)<sub>m</sub>-Y-, or a direct bond, wherein

n is an integer of from 1 to 6,

R<sup>9</sup> and R<sup>10</sup> are as described above;

m is an integer of 0 to 1, and  
Y is a direct bond, -O- or -N(R<sup>7</sup>)-, wherein  
R<sup>7</sup> is as described above;

or

5 X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>,

R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-; wherein

R<sup>8</sup> is as described above;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl,

10 and heterocycll, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, or  
from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylhetereocycl, fused heterocycl-  
heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroaryl(cycloalkyl, and fused  
cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and  
R<sup>47</sup>;

15 or

R<sup>1</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a  
cycloalkyl or heterocycll ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>,  
and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or  
more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

20 R<sup>4</sup> is as described above; and

R<sup>5</sup> is as described above;

wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>38</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>48</sup>, and R<sup>47</sup> are as described above;

or a pharmaceutically acceptable salt, solvate or prodrug thereof.

Further embodiments of these embodiments are clear from the appended claims.

25 The present invention also provides a compound according to the present invention  
for use as a medicament.

In one embodiment, the present invention provides a compound according to the  
present invention for treatment of hyperglycemia.

30 In one embodiment, the present invention provides a compound according to the  
present invention for treatment of IGT.

In one embodiment, the present invention provides a compound according to the  
present invention for treatment of Syndrome X.

In one embodiment, the present invention provides a compound according to the  
present invention for treatment of type 2 diabetes.

35 In one embodiment, the present invention provides a compound according to the  
present invention for treatment of type 1 diabetes.

In one embodiment, the present invention provides a compound according to the present invention for treatment of dyslipidemia or hyperlipidemia.

In one embodiment, the present invention provides a compound according to the present invention for treatment of hypertension.

5 In one embodiment, the present invention provides a compound according to the present invention for the treatment or prophylaxis of obesity.

In one embodiment, the present invention provides a compound according to the present invention for lowering of food intake.

10 In one embodiment, the present invention provides a compound according to the present invention for appetite regulation.

In one embodiment, the present invention provides a compound according to the present invention for regulating feeding behaviour.

15 In one embodiment, the present invention provides a compound according to the present invention for enhancing the secretion of enteroincretins. In a further embodiment, said enteroincretin is GLP-1.

The present invention also provides a pharmaceutical composition comprising, as an active ingredient, at least one compound according to the present invention together with one or more pharmaceutically acceptable carriers or excipients.

20 The present invention also provides a pharmaceutical composition comprising, as an active ingredient, at least one compound according to the present invention together with one or more pharmaceutically acceptable carriers or excipients in unit dosage form, comprising from about 0.05 mg to about 1000 mg, preferably from about 0.1 mg to about 500 mg and especially preferred from about 0.5 mg to about 200 mg of the compound according to the present invention.

25 In one embodiment, the pharmaceutical composition according to the present invention comprises a further antidiabetic agent.

In one embodiment, said further antidiabetic agent is insulin or an insulin analogue.

In one embodiment, said further antidiabetic agent is a sulphonylurea.

In one embodiment, said further antidiabetic agent is a biguanide.

30 In one embodiment, said further antidiabetic agent is a meglitinide.

In one embodiment, said further antidiabetic agent is an insulin sensitizer.

In one embodiment, said further antidiabetic agent is a thiazolidinedione insulin sensitizer.

In one embodiment, said further antidiabetic agent is an  $\alpha$ -glucosidase inhibitor.

35 In one embodiment, said further antidiabetic agent is a glycogen phosphorylase inhibitor.

In one embodiment, said further antidiabetic agent is an agent acting on the ATP-dependent potassium channel of the pancreatic  $\beta$ -cells.

In one embodiment, the pharmaceutical composition according to the present invention comprises a further antihyperlipidemic agent.

- 5      In one embodiment, said further antihyperlipidemic agent is cholestyramine.
- In one embodiment, said further antihyperlipidemic agent is colestipol.
- In one embodiment, said further antihyperlipidemic agent is clofibrate.
- In one embodiment, said further antihyperlipidemic agent is gemfibrozil.
- In one embodiment, said further antihyperlipidemic agent is lovastatin.
- 10     In one embodiment, said further antihyperlipidemic agent is pravastatin.
- In one embodiment, said further antihyperlipidemic agent is simvastatin.
- In one embodiment, said further antihyperlipidemic agent is probucol.
- In one embodiment, said further antihyperlipidemic agent is dextrothyroxine.
- 15     Included within the scope of the present invention are the individual enantiomers of the compounds represented by formula (I) above as well as any wholly or partially racemic mixtures thereof. The present invention also covers the individual enantiomers of the compounds represented by formula (I) above as mixtures with diastereoisomers thereof in which one or more stereocenters are inverted.
- 20     The present compounds are activators of glucokinase and are as such useful for the activation of glucokinase.

- Accordingly, the present invention provides a method for activating glucokinase in a patient in need thereof, which method comprises administering to a subject in need thereof a compound of the present invention, preferably a compound of formula (I), (II), or (III), preferably a pharmacologically effective amount, more preferably a therapeutically effective amount. The present invention also provides a method for lowering blood glucose in a patient in need thereof, which method comprises administering to a subject in need thereof a compound of the present invention, preferably a compound of formula (I), (II), or (III), preferably a pharmacologically effective amount, more preferably a therapeutically effective amount. The present invention also provides a method for prevention and/or treatment of glucokinase deficiency-mediated human diseases, the method comprising administration to a human in need thereof a therapeutically effective amount of a compound of the present invention, preferably a compound of formula (I), (II), or (III). As used herein, the phrase "a subject in need thereof" includes mammalian subjects, preferably humans, who either suffer from one or more of the aforesaid diseases or disease states or are at risk for such.
- 30     Accordingly, in the context of the therapeutic method of the present invention, this method also is comprised of a method for treating a mammalian subject prophylactically, or prior to

the onset of diagnosis such disease(s) or disease state(s). Other embodiments of such methods will be clear from the following description.

Compounds according to the present invention are useful for the treatment of disorders, diseases and conditions, wherein the activation of glucokinase is beneficial.

5        Accordingly, the present compounds are useful for the treatment of hyperglycemia, IGT (impaired glucose tolerance), insulin resistance syndrome, syndrome X, type 1 diabetes, type 2 diabetes, dyslipidemia, dyslipoproteinemia (abnormal lipoproteins in the blood) including diabetic dyslipidemia, hyperlipidemia, hyperlipoproteinemia (excess of lipoproteins in the blood) including type I, II-a (hypercholesterolemia), II-b, III, IV (hypertriglyceridemia) 10 and V (hypertriglyceridemia) hyperlipoproteinemas, and obesity. Furthermore, they may be useful for the treatment of albuminuria, cardiovascular diseases such as cardiac hypertrophy, hypertension and arteriosclerosis including atherosclerosis; gastrointestinal disorders; acute pancreatitis; and appetite regulation or energy expenditure disorders.

In one embodiment of a method according to the present invention, the effective 15 amount of the compound according to the present invention is in the range of from about 0.05 mg to about 2000 mg, preferably from about 0.1 mg to about 1000 mg and especially preferred from about 0.5 mg to about 500 mg per day.

In one embodiment of a method according to the present invention, the method is used in a regimen which comprises treatment with a further antidiabetic agent, such as a 20 further antidiabetic agent selected from insulin or an insulin analogue, a sulphonylurea, a biguanide, a meglitinide, an insulin sensitizer, a thiazolidinedione insulin sensitizer, an  $\alpha$ -glucosidase inhibitor, a glycogen phosphorylase inhibitor, and an agent acting on the ATP-dependent potassium channel of the pancreatic  $\beta$ -cells.

In one embodiment of a method according to the present invention, the method is 25 used in a regimen which comprises treatment with a further antihyperlipidemic agent, such as a further antihyperlipidemic agent selected from cholestyramine, colestipol, clofibrate, gemfibrozil, lovastatin, pravastatin, simvastatin, probucol, and dextrothyroxine.

In one embodiment of a method according to the present invention, the method is used in a regimen which comprises treatment with a further antiobesity agent.

30        In one embodiment of a method according to the present invention, the method is used in a regimen which comprises treatment with a further antihypertensive agent.

Accordingly, in a further aspect the invention relates to a compound according to the present invention for use as a medicament.

The invention also relates to pharmaceutical compositions comprising, as an active 35 ingredient, at least one compound of the present invention together with one or more pharmaceutically acceptable carriers or excipients.

The pharmaceutical composition is preferably in unit dosage form, comprising from about 0.05 mg to about 1000 mg, preferably from about 0.1 mg to about 500 mg and especially preferred from about 0.5 mg to about 200 mg of the compound of the present invention, such as a compound with formula (I), (II), or (III).

5 In one embodiment of the present invention, the present compounds are used for the preparation of a medicament for the treatment of hyperglycemia. As used herein hyperglycemia is to be taken as generally understood in the art, with reference for example to the Report of the Expert Committee of the Diagnosis and Classification of Diabetes Mellitus, published in *Diabetes Care* 20, 1183-1197, (1997), but is usually taken to mean an  
10 elevated plasma glucose level exceeding about 110 mg/dl. The present compounds are effective in lowering the blood glucose both in the fasting and postprandial stage.

In one embodiment of the present invention, the present compounds are used for the preparation of a pharmaceutical composition for the treatment of IGT.

15 In one embodiment of the present invention, the present compounds are used for the preparation of a pharmaceutical composition for the treatment of Syndrome X.

In one embodiment of the present invention, the present compounds are used for the preparation of a pharmaceutical composition for the treatment of type 2 diabetes. Such treatment includes a treatment for the purpose of the delaying of the progression from IGT to type 2 diabetes as well as delaying the progression from non-insulin requiring type 2  
20 diabetes to insulin requiring type 2 diabetes.

In one embodiment of the present invention the present compounds are used for the preparation of a pharmaceutical composition for the treatment of type 1 diabetes. Such therapy is normally accompanied by insulin administration.

25 In one embodiment of the present invention the present compounds are used for the preparation of a pharmaceutical composition for the treatment of dyslipidemia and hyperlipidemia.

In one embodiment of the present invention the present compounds are used for the preparation of a pharmaceutical composition for the treatment of obesity.

30 In another aspect of the present invention treatment of a patient with the present compounds are combined with diet and/or exercise.

The present invention provides methods of activating glucokinase activity in a mammal, which methods comprise administering, to a mammal in need of activation of glucokinase activity, a therapeutically defined amount of a compound of the present invention, such as a compound of formula (I), (II), or (III), defined above, as a single or  
35 polymorphic crystalline form or forms, an amorphous form, a single enantiomer, a racemic mixture, a single stereoisomer, a mixture of stereoisomers, a single diastereoisomer, a

mixture of diastereoisomers, a solvate, a pharmaceutically acceptable salt, a solvate, a prodrug, a biohydrolyzable ester, or a biohydrolyzable amide thereof.

The present invention provides a method of activating glucokinase, comprising the step of administering to a mammal in need thereof a pharmacologically effective amount of a compound of the present invention. The invention further provides a pharmaceutical composition comprising a pharmaceutically acceptable carrier and a pharmacologically effective amount of a compound of the present invention sufficient to activate glucokinase. A glucokinase - activating amount can be an amount that reduces or inhibits a PTPase activity in the subject.

10 Additionally provided by the present invention is a pharmaceutical composition comprising a pharmaceutically acceptable carrier and a pharmacologically effective amount of a compound of the present invention sufficient to treat type I diabetes.

15 Also provided by the present invention is a pharmaceutical composition comprising a pharmaceutically acceptable carrier and a pharmacologically effective amount of a compound of the present invention sufficient to treat type II diabetes.

The compounds of the present invention can be administered to any mammal in need of activation of glucokinase activity. Such mammals can include, for example, horses, cows, sheep, pigs, mice, dogs, cats, primates such as chimpanzees, gorillas, rhesus monkeys, and, most preferably humans.

20 In a further aspect of the present invention the present compounds are administered in combination with one or more further active substances in any suitable ratios. Such further active agents may be selected from antidiabetic agents, antihyperlipidemic agents, antiobesity agents, antihypertensive agents and agents for the treatment of complications resulting from or associated with diabetes.

25 Suitable antidiabetic agents include insulin, GLP-1 (glucagon like peptide-1) derivatives such as those disclosed in WO 98/08871 (Novo Nordisk A/S), which is incorporated herein by reference, as well as orally active hypoglycemic agents.

30 Suitable orally active hypoglycemic agents preferably include imidazolines, sulfonylureas, biguanides, meglitinides, oxadiazolidinediones, thiazolidinediones, insulin sensitizers,  $\alpha$ -glucosidase inhibitors, agents acting on the ATP-dependent potassium channel of the pancreatic  $\beta$ -cells eg potassium channel openers such as those disclosed in WO 97/26265, WO 99/03861 and WO 00/37474 (Novo Nordisk A/S) which are incorporated herein by reference, potassium channel openers, such as ormitiglinide, potassium channel blockers such as nateglinide or BTS-67582, glucagon antagonists such as those disclosed in 35 WO 99/01423 and WO 00/39088 (Novo Nordisk A/S and Agouron Pharmaceuticals, Inc.), all of which are incorporated herein by reference, GLP-1 agonists such as those disclosed in

WO 00/42026 (Novo Nordisk A/S and Agouron Pharmaceuticals, Inc.), which are incorporated herein by reference, DPP-IV (dipeptidyl peptidase-IV) inhibitors, PTPase (protein tyrosine phosphatase) inhibitors, inhibitors of hepatic enzymes involved in stimulation of gluconeogenesis and/or glycogenolysis, glucose uptake modulators, GSK-3 (glycogen synthase kinase-3) inhibitors, compounds modifying the lipid metabolism such as antihyperlipidemic agents and antilipidemic agents, compounds lowering food intake, and PPAR (peroxisome proliferator-activated receptor) and RXR (retinoid X receptor) agonists such as ALRT-268, LG-1268 or LG-1069.

5 In one embodiment of the present invention, the present compounds are administered in combination with insulin or insulin analogues.

10 In one embodiment of the present invention, the present compounds are administered in combination with a sulphonylurea eg tolbutamide, chlorpropamide, tolazamide, glibenclamide, glipizide, glimepiride, glicazide or glyburide.

15 In one embodiment of the present invention, the present compounds are administered in combination with a biguanide eg metformin.

In one embodiment of the present invention, the present compounds are administered in combination with a meglitinide eg repaglinide or senaglinide/nateglinide.

20 In one embodiment of the present invention, the present compounds are administered in combination with a thiazolidinedione insulin sensitizer eg troglitazone, ciglitazone, pioglitazone, rosiglitazone, isaglitazone, darglitazone, englitazone, CS-011/CI-1037 or T 174 or the compounds disclosed in WO 97/41097 (DRF-2344), WO 97/41119, WO 97/41120, WO 00/41121 and WO 98/45292 (Dr. Reddy's Research Foundation), which are incorporated herein by reference.

25 In one embodiment of the present invention the present compounds may be administered in combination with an insulin sensitizer eg such as GI 262570, YM-440, MCC-555, JTT-501, AR-H039242, KRP-297, GW-409544, CRE-16336, AR-H049020, LY510929, MBX-102, CLX-0940, GW-501516 or the compounds disclosed in WO 99/19313 (NN622/DRF-2725), WO 00/50414, WO 00/63191, WO 00/63192, WO 00/63193 (Dr. Reddy's Research Foundation) and WO 00/23425, WO 00/23415, WO 00/23451, WO 00/23445, WO 00/23417, WO 00/23416, WO 00/63153, WO 00/63196, WO 00/63209, WO 00/63190 and WO 00/63189 (Novo Nordisk A/S), which are incorporated herein by reference.

30 In one embodiment of the present invention the present compounds are administered in combination with an  $\alpha$ -glucosidase inhibitor eg voglibose, emiglitate, miglitol or acarbose.

In one embodiment of the present invention the present compounds are administered in combination with a glycogen phosphorylase inhibitor eg the compounds described in WO 97/09040 (Novo Nordisk A/S).

In one embodiment of the present invention the present compounds are 5 administered in combination with an agent acting on the ATP-dependent potassium channel of the pancreatic  $\beta$ -cells eg tolbutamide, glibenclamide, glipizide, glicazide, BTS-67582 or repaglinide.

In one embodiment of the present invention the present compounds are administered in combination with nateglinide.

10 In one embodiment of the present invention the present compounds are administered in combination with an antihyperlipidemic agent or a antilipidemic agent eg cholestyramine, colestipol, clofibrate, gemfibrozil, lovastatin, pravastatin, simvastatin, probucol or dextrothyroxine.

In another aspect of the present invention, the present compounds are administered 15 in combination with more than one of the above-mentioned compounds eg in combination with metformin and a sulphonylurea such as glyburide; a sulphonylurea and acarbose; nateglinide and metformin; acarbose and metformin; a sulfonylurea, metformin and troglitazone; insulin and a sulfonylurea; insulin and metformin; insulin, metformin and a sulfonylurea; insulin and troglitazone; insulin and lovastatin; etc.

20 Furthermore, the compounds according to the present invention may be administered in combination with one or more antiobesity agents or appetite regulating agents.

Such agents may be selected from the group consisting of CART (cocaine amphetamine regulated transcript) agonists, NPY (neuropeptide Y) antagonists, MC3 25 (melanocortin 3) agonists, MC4 (melanocortin 4) agonists, orexin antagonists, TNF (tumor necrosis factor) agonists, CRF (corticotropin releasing factor) agonists, CRF BP (corticotropin releasing factor binding protein) antagonists, urocortin agonists,  $\beta$ 3 adrenergic agonists such as CL-316243, AJ-9677, GW-0604, LY362884, LY377267 or AZ-40140, MSH (melanocyte-stimulating hormone) agonists, MCH (melanocyte-concentrating hormone) 30 antagonists, CCK (cholecystokinin) agonists, serotonin reuptake inhibitors (fluoxetine, seroxat or citalopram), serotonin and norepinephrine reuptake inhibitors, 5HT (serotonin) agonists, bombesin agonists, galanin antagonists, growth hormone, growth factors such as prolactin or placental lactogen, growth hormone releasing compounds, TRH (thyrotropin releasing hormone) agonists, UCP 2 or 3 (uncoupling protein 2 or 3) modulators, leptin 35 agonists, DA (dopamine) agonists (bromocriptin, doprexin), lipase/amylase inhibitors, PPAR modulators, RXR modulators, TR  $\beta$  agonists, adrenergic CNS stimulating agents, AGRP

(agouti related protein) inhibitors, H3 histamine antagonists such as those disclosed in WO 00/42023, WO 00/63208 and WO 00/64884, which are incorporated herein by reference, exendin-4, GLP-1 agonists and ciliary neurotrophic factor. Further antiobesity agents are bupropion (antidepressant), topiramate (anticonvulsant), ecopipam (dopamine D1/D5 antagonist) and naltrexone (opioid antagonist).

5 In one embodiment of the present invention the antiobesity agent is leptin.  
In one embodiment of the present invention the antiobesity agent is a serotonin and norepinephrine reuptake inhibitor eg sibutramine.  
In one embodiment of the present invention the antiobesity agent is a lipase inhibitor  
10 eg orlistat.

In one embodiment of the present invention the antiobesity agent is an adrenergic CNS stimulating agent eg dexamphetamine, amphetamine, phentermine, mazindol phendimetrazine, diethylpropion, fenfluramine or dexfenfluramine.

15 Furthermore, the present compounds may be administered in combination with one or more antihypertensive agents. Examples of antihypertensive agents are  $\beta$ -blockers such as alprenolol, atenolol, timolol, pindolol, propranolol and metoprolol, ACE (angiotensin converting enzyme) inhibitors such as benazepril, captopril, enalapril, fosinopril, lisinopril, quinapril and ramipril, calcium channel blockers such as nifedipine, felodipine, nicardipine, isradipine, nimodipine, diltiazem and verapamil, and  $\alpha$ -blockers such as doxazosin, urapidil,  
20 prazosin and terazosin. Further reference can be made to Remington: The Science and Practice of Pharmacy, 19th Edition, Gennaro, Ed., Mack Publishing Co., Easton, PA, 1995.

25 It should be understood that any suitable combination of the compounds according to the present invention with diet and/or exercise, one or more of the above-mentioned compounds and optionally one or more other active substances are considered to be within the scope of the present invention.

## PHARMACEUTICAL COMPOSITIONS

The compounds of the present invention may be administered alone or in combination with pharmaceutically acceptable carriers or excipients, in either single or multiple doses. The pharmaceutical compositions according to the present invention may be 30 formulated with pharmaceutically acceptable carriers or diluents as well as any other known adjuvants and excipients in accordance with conventional techniques such as those disclosed in Remington: The Science and Practice of Pharmacy, 19<sup>th</sup> Edition, Gennaro, Ed., Mack Publishing Co., Easton, PA, 1995.

35 The pharmaceutical compositions may be specifically formulated for administration by any suitable route such as the oral, rectal, nasal, pulmonary, topical (including buccal and

sublingual), transdermal, intracisternal, intraperitoneal, vaginal and parenteral (including subcutaneous, intramuscular, intrathecal, intravenous and intradermal) route, the oral route being preferred. It will be appreciated that the preferred route will depend on the general condition and age of the subject to be treated, the nature of the condition to be treated and

5 the active ingredient chosen.

Pharmaceutical compositions for oral administration include solid dosage forms such as hard or soft capsules, tablets, troches, dragees, pills, lozenges, powders and granules. Where appropriate, they can be prepared with coatings such as enteric coatings or they can be formulated so as to provide controlled release of the active ingredient such as

10 sustained or prolonged release according to methods well known in the art.

Liquid dosage forms for oral administration include solutions, emulsions, aqueous or oily suspensions, syrups and elixirs.

Pharmaceutical compositions for parenteral administration include sterile aqueous and non-aqueous injectable solutions, dispersions, suspensions or emulsions as well as

15 sterile powders to be reconstituted in sterile injectable solutions or dispersions prior to use.

Depot injectable formulations are also contemplated as being within the scope of the present invention.

Other suitable administration forms include suppositories, sprays, ointments, cremes, gels, inhalants, dermal patches, implants etc.

20 A typical oral dosage is in the range of from about 0.001 to about 100 mg/kg body weight per day, preferably from about 0.01 to about 50 mg/kg body weight per day, and more preferred from about 0.05 to about 10 mg/kg body weight per day administered in one or more dosages such as 1 to 3 dosages. The exact dosage will depend upon the frequency and mode of administration, the sex, age, weight and general condition of the subject

25 treated, the nature and severity of the condition treated and any concomitant diseases to be treated and other factors evident to those skilled in the art.

The formulations may conveniently be presented in unit dosage form by methods known to those skilled in the art. A typical unit dosage form for oral administration one or more times per day such as 1 to 3 times per day may contain from 0.05 to about 1000 mg, 30 preferably from about 0.1 to about 500 mg, and more preferred from about 0.5 mg to about 200 mg.

For parenteral routes such as intravenous, intrathecal, intramuscular and similar administration, typically doses are in the order of about half the dose employed for oral administration.

35 The compounds of this invention are generally utilized as the free substance or as a pharmaceutically acceptable salt thereof. Examples are an acid addition salt of a compound

having the utility of a free base and a base addition salt of a compound having the utility of a free acid. The term "pharmaceutically acceptable salts" refers to non-toxic salts of the compounds of this invention which are generally prepared by reacting the free base with a suitable organic or inorganic acid or by reacting the acid with a suitable organic or inorganic base. When a compound of the present invention, such as a compound of formula (I), (II), or (III), contains a free base such salts are prepared in a conventional manner by treating a solution or suspension of the compound with a chemical equivalent of a pharmaceutically acceptable acid. When a compound of the present invention, such as a compound of formula (I), (II), or (III), contains a free acid such salts are prepared in a conventional manner by 5 treating a solution or suspension of the compound with a chemical equivalent of a pharmaceutically acceptable base. Physiologically acceptable salts of a compound with a hydroxy group include the anion of said compound in combination with a suitable cation such as sodium or ammonium ion. Other salts which are not pharmaceutically acceptable may be useful in the preparation of compounds of the present invention and these form a further 10 aspect of the present invention.

For parenteral administration, solutions of the novel compounds of the formula (I) in sterile aqueous solution, aqueous propylene glycol or sesame or peanut oil may be employed. Such aqueous solutions should be suitably buffered if necessary and the liquid diluent first rendered isotonic with sufficient saline or glucose. The aqueous solutions are 20 particularly suitable for intravenous, intramuscular, subcutaneous and intraperitoneal administration. The sterile aqueous media employed are all readily available by standard techniques known to those skilled in the art.

Suitable pharmaceutical carriers include inert solid diluents or fillers, sterile aqueous solution and various organic solvents. Examples of solid carriers are lactose, terra alba, sucrose, cyclodextrin, talc, gelatine, agar, pectin, acacia, magnesium stearate, stearic acid 25 and lower alkyl ethers of cellulose. Examples of liquid carriers are syrup, peanut oil, olive oil, phospholipids, fatty acids, fatty acid amines, polyoxyethylene and water. Similarly, the carrier or diluent may include any sustained release material known in the art, such as glyceryl monostearate or glyceryl distearate, alone or mixed with a wax. The pharmaceutical compositions formed by combining the novel compounds of the present invention and the pharmaceutically acceptable carriers are then readily administered in a variety of dosage 30 forms suitable for the disclosed routes of administration. The formulations may conveniently be presented in unit dosage form by methods known in the art of pharmacy.

Formulations of the present invention suitable for oral administration may be 35 presented as discrete units such as capsules or tablets, each containing a predetermined amount of the active ingredient, and which may include a suitable excipient. Furthermore, the

orally available formulations may be in the form of a powder or granules, a solution or suspension in an aqueous or non-aqueous liquid, or an oil-in-water or water-in-oil liquid emulsion.

- Compositions intended for oral use may be prepared according to any known method, and such compositions may contain one or more agents selected from the group consisting of sweetening agents, flavoring agents, coloring agents, and preserving agents in order to provide pharmaceutically elegant and palatable preparations. Tablets may contain the active ingredient in admixture with non-toxic pharmaceutically-acceptable excipients which are suitable for the manufacture of tablets. These excipients may be for example, inert diluents, such as calcium carbonate, sodium carbonate, lactose, calcium phosphate or sodium phosphate; granulating and disintegrating agents, for example corn starch or alginic acid; binding agents, for example, starch, gelatin or acacia; and lubricating agents, for example magnesium stearate, stearic acid or talc. The tablets may be uncoated or they may be coated by known techniques to delay disintegration and absorption in the gastrointestinal tract and thereby provide a sustained action over a longer period. For example, a time delay material such as glyceryl monostearate or glyceryl distearate may be employed. They may also be coated by the techniques described in U.S. Patent Nos. 4,356,108; 4,166,452; and 4,265,874, incorporated herein by reference, to form osmotic therapeutic tablets for controlled release.
- Formulations for oral use may also be presented as hard gelatin capsules where the active ingredient is mixed with an inert solid diluent, for example, calcium carbonate, calcium phosphate or kaolin, or a soft gelatin capsules wherein the active ingredient is mixed with water or an oil medium, for example peanut oil, liquid paraffin, or olive oil.
- Aqueous suspensions may contain the active compounds in admixture with excipients suitable for the manufacture of aqueous suspensions. Such excipients are suspending agents, for example sodium carboxymethylcellulose, methylcellulose, hydroxypropylmethylcellulose, sodium alginate, polyvinylpyrrolidone, gum tragacanth and gum acacia; dispersing or wetting agents may be a naturally-occurring phosphatide such as lecithin, or condensation products of an alkylene oxide with fatty acids, for example polyoxyethylene stearate, or condensation products of ethylene oxide with long chain aliphatic alcohols, for example, heptadecaethyl-eneoxycetanol, or condensation products of ethylene oxide with partial esters derived from fatty acids and a hexitol such as polyoxyethylene sorbitol monooleate, or condensation products of ethylene oxide with partial esters derived from fatty acids and hexitol anhydrides, for example polyethylene sorbitan monooleate. The aqueous suspensions may also contain one or more coloring agents, one or more flavoring agents, and one or more sweetening agents, such as sucrose or saccharin.

Oily suspensions may be formulated by suspending the active ingredient in a vegetable oil, for example arachis oil, olive oil, sesame oil or coconut oil, or in a mineral oil such as a liquid paraffin. The oily suspensions may contain a thickening agent, for example beeswax, hard paraffin or cetyl alcohol. Sweetening agents such as those set forth above, and flavoring agents may be added to provide a palatable oral preparation. These compositions may be preserved by the addition of an anti-oxidant such as ascorbic acid.

5 Dispersible powders and granules suitable for preparation of an aqueous suspension by the addition of water provide the active compound in admixture with a dispersing or wetting agent, suspending agent and one or more preservatives. Suitable dispersing or wetting agents and suspending agents are exemplified by those already mentioned above. Additional excipients, for example, sweetening, flavoring, and coloring agents may also be present.

10 The pharmaceutical compositions of the present invention may also be in the form of oil-in-water emulsions. The oily phase may be a vegetable oil, for example, olive oil or arachis oil, or a mineral oil, for example a liquid paraffin, or a mixture thereof. Suitable 15 emulsifying agents may be naturally-occurring gums, for example gum acacia or gum tragacanth, naturally-occurring phosphatides, for example soy bean, lecithin, and esters or partial esters derived from fatty acids and hexitol anhydrides, for example sorbitan monooleate, and condensation products of said partial esters with ethylene oxide, for 20 example polyoxyethylene sorbitan monooleate. The emulsions may also contain sweetening and flavoring agents.

Syrups and elixirs may be formulated with sweetening agents, for example glycerol, propylene glycol, sorbitol or sucrose. Such formulations may also contain a demulcent, a preservative and flavoring and coloring agents. The pharmaceutical compositions may be in 25 the form of a sterile injectable aqueous or oleaginous suspension. This suspension may be formulated according to the known methods using suitable dispersing or wetting agents and suspending agents described above. The sterile injectable preparation may also be a sterile injectable solution or suspension in a non-toxic parenterally-acceptable diluent or solvent, for example as a solution in 1,3-butanediol. Among the acceptable vehicles and solvents that 30 may be employed are water, Ringer's solution, and isotonic sodium chloride solution. In addition, sterile, fixed oils are conveniently employed as solvent or suspending medium. For this purpose, any bland fixed oil may be employed using synthetic mono- or diglycerides. In addition, fatty acids such as oleic acid find use in the preparation of injectables.

35 The compositions may also be in the form of suppositories for rectal administration of the compounds of the present invention. These compositions can be prepared by mixing the drug with a suitable non-irritating excipient which is solid at ordinary temperatures but

liquid at the rectal temperature and will thus melt in the rectum to release the drug. Such materials include cocoa butter and polyethylene glycols, for example.

For topical use, creams, ointments, jellies, solutions of suspensions, etc., containing the compounds of the present invention are contemplated. For the purpose of this

5 application, topical applications shall include mouth washes and gargles.

The compounds of the present invention may also be administered in the form of liposome delivery systems, such as small unilamellar vesicles, large unilamellar vesicles, and multilamellar vesicles. Liposomes may be formed from a variety of phospholipids, such as cholesterol, stearylamine, or phosphatidylcholines.

10 In addition, some of the compounds of the present invention may form solvates with water or common organic solvents. Such solvates are also encompassed within the scope of the present invention.

Thus, in a further embodiment, there is provided a pharmaceutical composition comprising a compound of the present invention, or a pharmaceutically acceptable salt, 15 solvate, or prodrug therof, and one or more pharmaceutically acceptable carriers, excipients, or diluents.

If a solid carrier is used for oral administration, the preparation may be tabletted, placed in a hard gelatine capsule in powder or pellet form or it can be in the form of a troche or lozenge. The amount of solid carrier will vary widely but will usually be from about 25 mg 20 to about 1 g. If a liquid carrier is used, the preparation may be in the form of a syrup, emulsion, soft gelatine capsule or sterile injectable liquid such as an aqueous or non-aqueous liquid suspension or solution.

A typical tablet that may be prepared by conventional tabletting techniques may contain:

25	Core:		
	Active compound (as free compound or salt thereof)		5.0 mg
	Lactosum Ph. Eur.		67.8 mg
	Cellulose, microcryst. (Avicel)		31.4 mg
	Amberlite® IRP88*		1.0 mg
30	Magnesii stearas Ph. Eur.		q.s.

Coating:

Hydroxypropyl methylcellulose	approx.	9 mg
Mywacelt 9-40 T**	approx.	0.9 mg

\*\* Acylated monoglyceride used as plasticizer for film coating.

If desired, the pharmaceutical composition of the present invention may comprise a compound according to the present invention in combination with further active substances such as those described in the foregoing.

The present invention also provides a method for the synthesis of compounds useful as intermediates in the preparation of compounds of formula (I) along with methods for the preparation of compounds of formula (I). The compounds can be prepared readily according to the following reaction Schemes (in which all variables are as defined before, unless so specified) using readily available starting materials, reagents and conventional synthesis procedures. In these reactions, it is also possible to make use of variants which are themselves known to those of ordinary skill in this art, but are not mentioned in greater detail.

### Abbreviations

Abbreviations used in the Schemes and Examples are as follows:

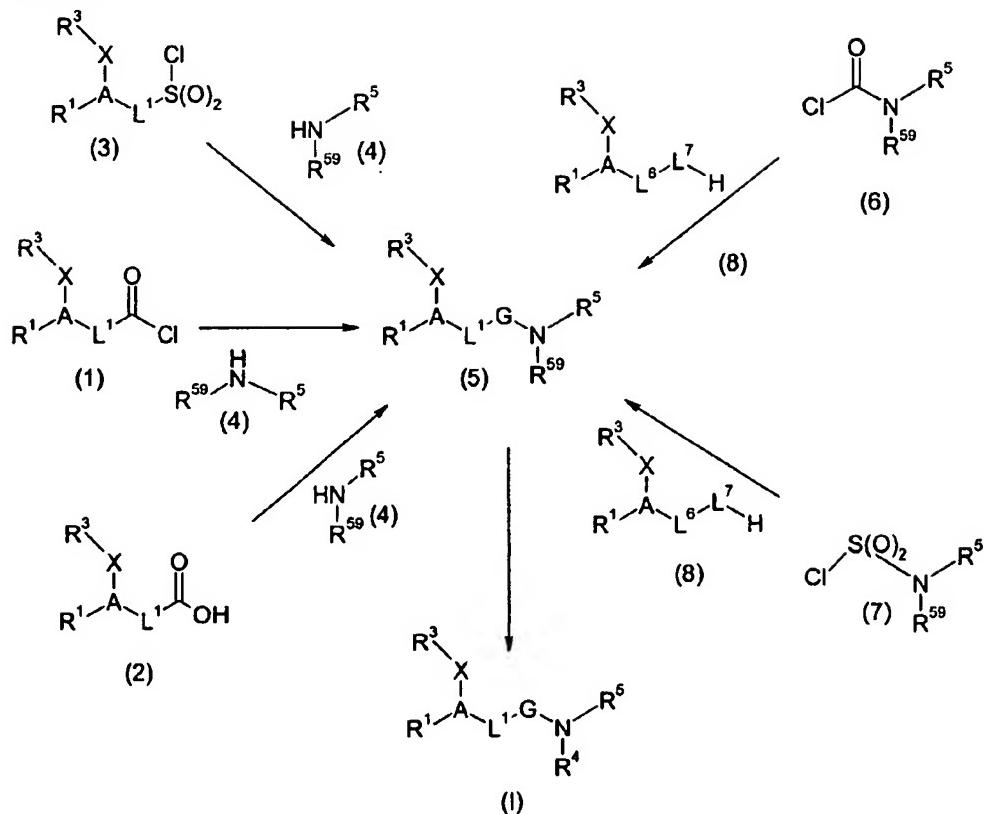
15	d	= days
	g	= grams
	h	= hours
	Hz	= hertz
	kD	= kiloDalton
20	L	= liters
	M	= molar
	mbar	= millibar
	mg	= milligrams
	min	= minutes
25	ml	= milliliters
	mM	= millimolar
	mmol	= millimoles
	mol	= moles
	N	= normal
30	ppm	= parts per million
	psi	= pounds per square inch
	APCI	= atmospheric pressure chemical ionization
	ESI	= electrospray ionization
	i.v.	= intravenous
35	m/z	= mass to charge ratio

mp	= melting point
MS	= mass spectrometry
NMR	= nuclear magnetic resonance spectroscopy
p.o.	= per oral
5 R <sub>f</sub>	= relative TLC mobility
rt	= room temperature
s.c.	= subcutaneous
TLC	= thin layer chromatography
t <sub>r</sub>	= retention time
10 BOP	= (1-benzotriazolyloxy)tris(dimethylamino)phosphonium hexafluorophosphate
DCM	= dichloromethane
DIEA	= diisopropylethylamine
DMF	= N, N-dimethylformamide
DMPU	= 1,3-dimethylpropylene urea
15 DMSO	= dimethylsulfoxide
EDC	= 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide hydrochloride
ether	= diethyl ether
EtOAc	= ethyl acetate
HMPA	= hexamethylphosphoric triamide
20 HOEt	= 1-hydroxybenzotriazole
LAH	= lithium aluminum hydride
LDA	= lithium diisopropylamide
MeOH	= methanol
NMM	= N-methylmorpholine, 4-methylmorpholine
25 TEA	= triethylamine
TFA	= trifluoroacetic acid
THF	= tetrahydrofuran
THP	= tetrahydropyranyl
TTF	= fluoro-N,N,N'-tetramethylformamidinium hexafluorophosphate

30 Reaction schemes

Unless otherwise specified, the variables in the Schemes are as defined for formula (I).

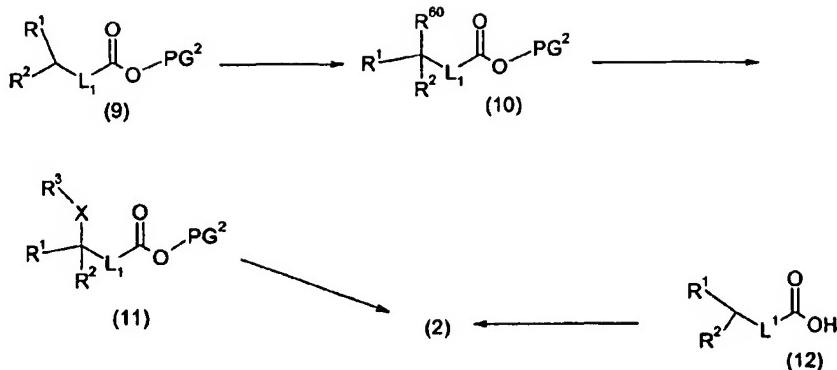
Scheme 1 describes the preparation of compounds of formula (I).

Scheme 1

$L^6$  is  $-(CH_2)_n-C(R^9)(R^{10})_m-$ , wherein  $n$ ,  $m$ ,  $R^9$ , and  $R^{10}$  are as defined for formula (I).

- The sulfonyl chloride (3) may be treated with the amine (4) in the presence of a tertiary amine base such as TEA to afford (5) where G is  $S(O)_2$ .  $R^{59}$  may be  $R^4$ , or  $R^{59}$  may be a linkage to a polymer support such as Wang Resin. Treatment of such a polymer-supported (5) with TFA in a suitable solvent such as dichloromethane affords (I) where  $R^4$  is H. (1) may be treated with the amine (4) to afford (5), and subsequently (I), in like manner. The acid (2) may be activated by treatment with a carbodiimide reagent such as EDC, or with a coupling agent such as TFFH, in a solvent such as DCM or DMF, in the presence of (4) to afford (5). (5) may be converted in like manner to (I). The carbamyl chloride (6) may be prepared by treatment of (4) with a reagent such as phosgene, diphosgene, or triphosgene in a solvent such as DCM in the presence of a tertiary amine base such as TEA. Treatment of (8) with (6) in the presence of a tertiary amine base such as TEA affords (5), and in like manner, (I). The chlorosulfonamide (7) may be prepared by treatment of (4) with sulfonyl chloride in the presence of a tertiary amine base such as TEA or DIEA. (7) may be treated with (8) in a suitable solvent such as DCM in the presence of a tertiary amine base such as TEA or DIEA to afford 5, and, in like manner to the previous, (I).

Scheme 2 describes the preparation of the compound of formula (2).

Scheme 2

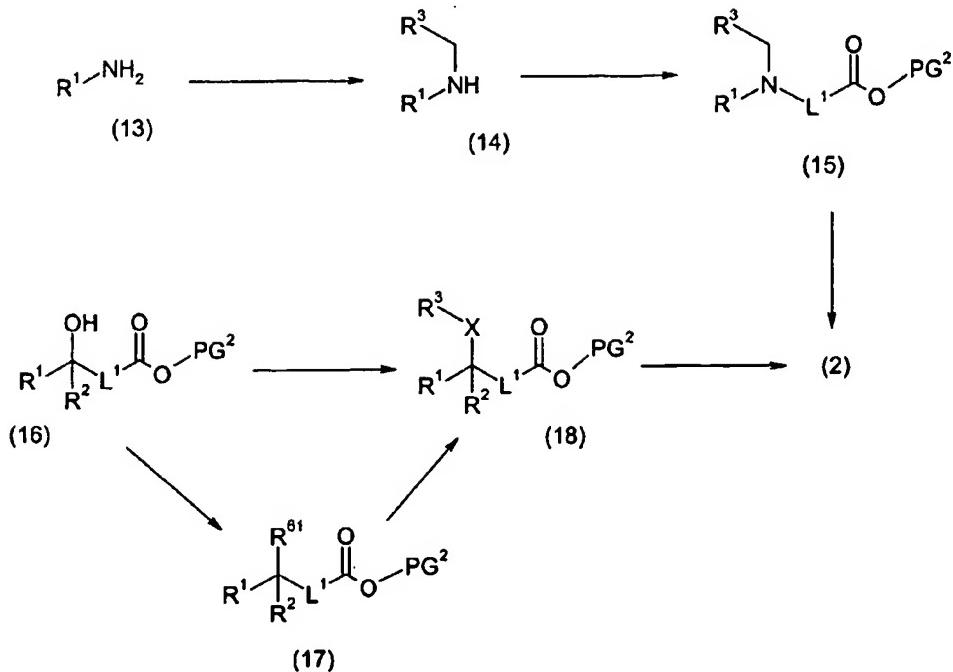
The ester (9), where  $\text{PG}^2$  is a carboxy protecting group, may be treated with N-bromosuccinimide in the presence of benzoyl peroxide to afford (10) where  $\text{R}^{60}$  is bromide.

Typically this procedure is preferable where  $\text{R}^1$  is aryl or heteroaryl. (10) where  $\text{R}^{60}$  is

- 5 bromide may be treated with a reagent  $\text{R}^3\text{-SH}$ ,  $\text{R}^3\text{-N}(\text{R}^6)\text{H}$ , or  $\text{R}^3\text{-OH}$  and a base such as sodium hydride or potassium tert-butoxide to afford (11) where  $\text{X}$  is  $\text{S}$ ,  $\text{N}(\text{R}^8)$ , or  $\text{O}$ , respectively. (11) may be deprotected with, for example, aqueous alkali where  $\text{PG}^2$  is methyl or ethyl, to afford (2). Where  $\text{L}^1$  is a direct bond, treatment of (9) with base such as LDA and an oxidizing agent such as a sulfonyl-oxaziridine reagent affords (10) where  $\text{R}^{60}$  is OH.

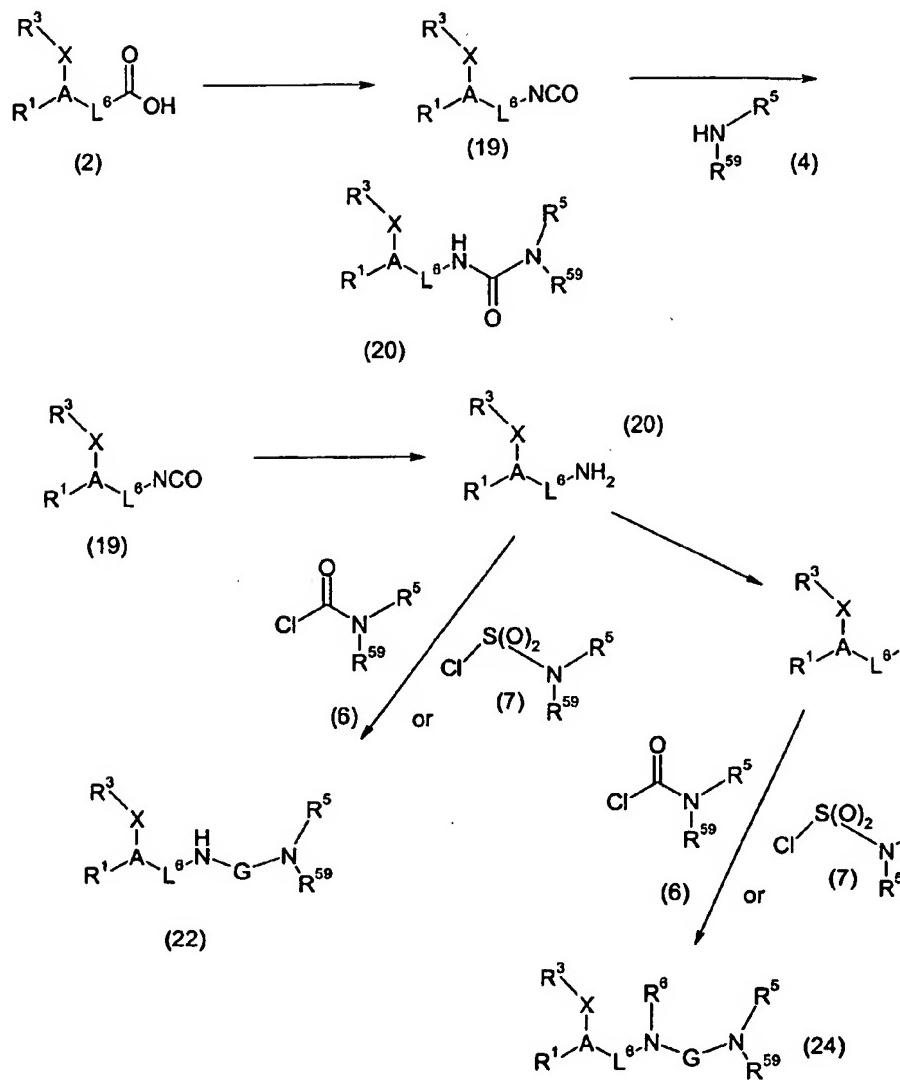
- 10 Treatment of such with a reagent  $\text{R}^3\text{-LG}^1$ , where  $\text{LG}^1$  is a nucleofugal group such as Br, Cl, I, or sulfonate, and a base such as DBU or sodium hydride affords (11). Further, treatment of (12) with two equivalents of strong base such as LDA and a reagent  $\text{R}^3\text{-S-LG}^2$ , where  $\text{LG}^2$  is an arylsulfinate group or halogen, affords (2) where  $\text{X}$  is S.

Scheme 3 describes an alternate preparation of a compound of formula (2).

Scheme 3

- An amine (13) may be alkylated with an alkyl halide  $R^3-CH_2-LG^1$ , where  $LG^1$  is a nucleofugal group such as tosylate or bromide or iodide, in the presence of a base such as potassium carbonate in a solvent such as DMF to afford (14). Alternately, (13) may be treated with an aldehyde  $R^3-CHO$  in the presence of a reducing agent such as sodium cyanoborohydride to afford (14). The amine (14) may be treated with a reagent  $LG^1-L^1-COO-PG^2$ , where  $LG^1$  is a nucleofugal group such as tosylate, iodide, or bromide, in the presence of an organic base such as potassium carbonate, in a solvent such as DMF, to afford (15).  $PG^2$  is a carboxyl protecting group such as allyl or methyl, or benzyl, which may be removed by hydrolysis in, for example, aqueous base to afford (2). The hydroxyester (16) may be treated with  $R^3-LG^1$  in the presence of a base such as DBU, DIEA, or sodium hydride, to afford (18) where X is O. Alternately, (16) may be treated with methanesulfonyl chloride, toluenesulfonyl chloride, or trifluoromethanesulfonic anhydride to afford (17) where  $R^{61}$  is an arylsulfonate or alkylsulfonate group. (17) may then be treated with  $R^3-XH$ , where X is O, S, or N- $R^6$ , in the presence of a suitable base such as TEA, DIEA, NaH, DBU, potassium t-butoxide, or the like, to afford (18). (18) may be deprotected as described above to afford (2).

Scheme 4 describes an alternate preparation of compounds of formula (I).

Scheme 4

$\text{L}^6$  is as defined for Scheme 1.

The acid (2) may be treated with oxalyl chloride or thionyl chloride in a solvent such as DCM, followed by sodium azide, to afford an acyl azide intermediate. Alternately, (2) may be treated with diphenylphosphoryl azide in the presence of a base such as DIEA, to afford 5 an acyl azide intermediate. The acyl azide intermediate is heated at a temperature of from 25 to 100°C to afford the isocyanate (19), which may be treated with an amine (4) to afford. Alternately, (19) may be hydrolyzed in weak aqueous acid or weak aqueous base to afford 10 the amine (20). The amine (20) may be treated with an aldehyde or ketone embodying the  $\text{R}^8$  group, in the presence of a reducing agent such as sodium triacetoxyborohydride, to afford (23). (23) may be treated with reagents (6) or (7) in manner analogous to Scheme 1 to afford

(24). The amine (20) may be treated with reagents (6) or (7) in like manner to afford (22).

Where R<sup>30</sup> is a solid support such as Wang Resin, (22) and (24) may be treated with TFA as in Scheme 1 to afford (I).

In the above schemes, "PG<sup>1</sup>" represents an amino protecting group. The term

- 5 "amino protecting group" as used herein refers to substituents of the amino group commonly employed to block or protect the amino functionality while reacting other functional groups on the compound. Examples of such amino-protecting groups include the formyl group, the trityl group, the phthalimido group, the trichloroacetyl group, the chloroacetyl, bromoacetyl and iodoacetyl groups, urethane-type blocking groups (PG<sup>1</sup> as used herein) such as benzyloxy-  
10 carbonyl, 4-phenylbenzyloxycarbonyl, 2-methylbenzyloxycarbonyl, 4-methoxybenzyloxy- carbonyl, 4-fluorobenzyloxycarbonyl, 4-chlorobenzyloxycarbonyl, 3-chlorobenzyloxycarbonyl, 2-chlorobenzyloxycarbonyl, 2,4-dichlorobenzyloxycarbonyl, 4-bromobenzyloxycarbonyl, 3- bromobenzyloxycarbonyl, 4-nitrobenzyloxycarbonyl, 4-cyanobenzyloxy-carbonyl, 2-(4- xenyl)iso-propoxycarbonyl, 1,1-diphenyleth-1-yloxycarbonyl, 1,1-diphenylprop-1-yloxy-  
15 carbonyl, 2-phenylprop-2-yloxycarbonyl, 2-(p-tolyl)prop-2-yloxycarbonyl, cyclopentanyloxy- carbonyl, 1-methylcyclopentanyloxy carbonyl, cyclohexanyloxy carbonyl, 1-methylcyclo- hexanyloxy carbonyl, 2-methylcyclohexanyloxy carbonyl, 2-(4-tolylsulfonyl)ethoxycarbonyl, 2(methylsulfonyl)ethoxycarbonyl, 2-(triphenylphosphino)ethoxycarbonyl, 9-fluorenylmethoxy- carbonyl ("FMOC"), t-butoxycarbonyl ("BOC"), 2-(trimethylsilyl)ethoxycarbonyl, allyloxy-  
20 carbonyl, 1-(trimethylsilylmethyl)prop-1-enyloxycarbonyl, 5-benzisoxalylmethoxycarbonyl, 4- acetoxybenzyloxycarbonyl, 2,2,2-trichloroethoxycarbonyl, 2-ethynyl-2-propoxycarbonyl, cyclopropylmethoxycarbonyl, 4-(decyloxy)benzyloxycarbonyl, isobornyloxycarbonyl, 1- piperidyloxycarbonyl and the like; the benzoylmethylsulfonyl group, the 2-(nitro)phenyl- sulfenyl group, the diphenylphosphine oxide group and like amino-protecting groups. The  
25 species of amino-protecting group employed is not critical so long as the derivatized amino group is stable to the condition of subsequent reaction(s) on other positions of the compound of formula (I) and can be removed at the desired point without disrupting the remainder of the molecule. Preferred amino-protecting groups are the allyloxycarbonyl, the t-butoxycarbonyl, 9-fluorenylmethoxycarbonyl, and the trityl groups. Similar amino-protecting groups used in  
30 the cephalosporin, penicillin and peptide art are also embraced by the above terms. Further examples of groups referred to by the above terms are described by J. W. Barton, "Protective Groups In Organic Chemistry", J. G. W. McOmie, Ed., Plenum Press, New York, N.Y., 1973, Chapter 2, and T. W. Greene, "Protective Groups in Organic Synthesis", John Wiley and Sons, New York, N.Y., 1981, Chapter 7. The related term "protected amino" defines an  
35 amino group substituted with an amino-protecting group discussed above. In the above schemes, "PG<sup>2</sup>" represents carboxyl protecting group. The term "carboxyl protecting group"

as used herein refers to substituents of the carboxyl group commonly employed to block or protect the -OH functionality while reacting other functional groups on the compound.

Examples of such alcohol -protecting groups include the 2-tetrahydropyranyl group, 2-ethoxyethyl group, the trityl group, the methyl group, the ethyl group, the allyl group, the trimethylsilylethoxymethyl group, the 2,2,2-trichloroethyl group, the benzyl group, and the trialkylsilyl group, examples of such being trimethylsilyl, tert-butyldimethylsilyl, phenyldimethylsilyl, triisopropylsilyl and thexyldimethylsilyl. The choice of carboxyl protecting group employed is not critical so long as the derivatized alcohol group is stable to the condition of subsequent reaction(s) on other positions of the compound of the formulae and

can be removed at the desired point without disrupting the remainder of the molecule.

Further examples of groups referred to by the above terms are described by J. W. Barton, "Protective Groups In Organic Chemistry", J. G. W. McOmie, Ed., Plenum Press, New York, N.Y., 1973, and T. W. Greene, "Protective Groups in Organic Synthesis", John Wiley and Sons, New York, N.Y., 1981. The related term "protected carboxyl" defines a carboxyl group substituted with a carboxyl -protecting group as discussed above.

## EXAMPLES

### General Procedure A. Synthesis of 2-aryloxyalkanoic acids

To a mixture of ethyl or methyl ester of 2-hydroxyalkanoic acid (2.0 mmol), phenol (2.4 mmol) and triphenylphosphine (0.63 g, 2.4 mmol) in anhydrous THF (6 ml) is added drop wise diisopropyl azodicarboxylate (0.47 ml, 2.4 mmol) with stirring at 0°C. The mixture is stirred at 0°C for 1 h and then at 25°C for 8 h. The solvent is removed and the residue is purified by flash chromatography [silica, ethyl acetate-hexanes (1:9)] to afford the ethyl or methyl ester of 2-aryloxyalkanoic acid. The ester is dissolved in methanol (10 ml) and is added 1 M solution of lithium hydroxide (5 ml). The resulting mixture is stirred for 2 h at 25°C. The reaction mixture is concentrated *in vacuo*. The residue is acidified with dilute HCl and extracted with ethyl acetate (2x10 ml). The organic layer is dried ( $\text{Na}_2\text{SO}_4$ ) and concentrated to provide the desired 2-aryloxyalkanoic acid.

### General Procedure B. Synthesis of 2-aryloxyalkanoic acids

To a mixture of phenol (2 mmol) and potassium *t*-butoxide (0.47 g, 4.2 mmol) in DMF (6 ml) is added a solution of 2-bromohexanoic acid in DMF (2 ml) rapidly at 0°C. The reaction mixture is stirred at 25°C for 15 h. The resulting mixture is poured into cold 1 N HCl (10 ml) and extracted with ether (2x20 ml). The combined extracts are washed with brine,

dried ( $\text{Na}_2\text{SO}_4$ ) and concentrated *in vacuo* to obtain the desired acid in 70-80% yield. The crude acids are used as such in the preparation of amides.

#### **General Procedure C. Synthesis of 2-alkyl- and 2-arylthioalkanoic acids**

- A mixture of methyl ester of arylacetic acid (10 mmol), NBS (10.5 mmol) and 5 benzoyl peroxide (0.2 mmol) in  $\text{CCl}_4$  (50 ml) is heated to reflux for 5 h. The precipitated succinimide is filtered and the filtrate is concentrated *in vacuo*. The residue is dissolved in ethyl acetate (50 ml) and is washed with water (2x50 ml),  $\text{Na}_2\text{HCO}_3$  (2x30 ml) and brine (2x30 ml) and dried (anhyd.  $\text{Na}_2\text{SO}_4$ ). Concentration *in vacuo* furnished the 2-bromo-2-aryl-acetic acid methyl ester in 75-82% yield.
- 10 To a solution of 2-bromo-2-arylacetic acid methyl ester (2 mmol) in THF (8 ml) is added alkyl thiol (2.4 mmol) followed by  $\text{Et}_3\text{N}$  (4.4 mmol). The mixture is stirred at 25°C for 2 h. The reaction mixture is concentrated *in vacuo* and the residue is purified by flash column chromatography (silica, hexanes-ethyl acetate, 9:1) to give the 2-alkylthio-2-arylacetic acid methyl ester. Similar procedure is adopted for the synthesis of 2-arylthio-2-arylacetic acid 15 methyl ester.

#### **General Procedure D. Synthesis of 2-alkyl- and 2-arylthioalkanoic acids**

- To a solution of 2-hydroxy 2-arylacetic acid methyl ester (2 mmol) in  $\text{CH}_2\text{Cl}_2$  (8 ml) are added  $\text{MsCl}$  (2.4 mmol) and  $\text{Et}_3\text{N}$  (4.4 mmol) at 0°C and stirred for 1 h. To this solution is added alkyl thiol (2.4 mmol) at 0°C and is stirred for 2 h. The mixture is concentrated *in vacuo* 20 and the residue is dissolved in ethyl acetate (30 ml). The organic layer is washed with water (2x20 ml), brine (2x20 ml) and dried (anhyd.  $\text{Na}_2\text{SO}_4$ ). Concentration *in vacuo* afforded an oil which is purification by flash chromatography (silica, hexanes-ethyl acetate, 9:1) to furnish the 2-alkylthio-2-arylacetic acid methyl ester. Similar procedure is adopted for the synthesis of 2-arylthio-2-arylacetic acid methyl ester. Hydrolysis of this ester is carried out as 25 described in procedure A.

#### **General Procedure E. Synthesis of heteroaryl amides of substituted alkanoic acids**

- To a solution of 2-aryloxyalkanoic acid (0.25 mmol) in THF (3 ml) are added TFFH (80 mg, 0.3 mmol) and DIEA (0.1 ml). The mixture is stirred for 30 min and amine is added (0.6 mmol). The contents are stirred for 10 h and concentrated *in vacuo*. The residue is 30 purified by flash chromatography [silica, ethyl acetate-hexanes (3:7)] to afford the desired amide.

**General Procedure F: Synthesis of hetero aromatic amides of aryl-N-cycloalkyl amino acids**

N-Boc aryl amino acid is coupled with heteroaromatic amine as described in procedure E. The N-Boc protected aryl amino acid amide (2 mmol) is treated with 4N HCl in dioxane (5 ml). The mixture is stirred at 25°C for 30 min. The solution is concentrated in vacuo and the residue is treated with TEA (5 mmol). The mixture is diluted with ethyl acetate (30 ml). The organic layer is washed with water (2x20 ml), brine (2x20 ml) and dried (Na<sub>2</sub>SO<sub>4</sub>). Concentration in vacuo afforded the corresponding Boc-deprotected amine. The amine (1 mmol) is treated with cycloalkanone (1.1 mmol) in 1,2-dichloroethane. The mixture is stirred at 25°C for 30 min. To this solution is added sodium triacetoxy borohydride (1.1 mmol) and the mixture is stirred for 12 h. The mixture is concentrated in vacuo and the residue is dissolved in ethyl acetate (30 ml). The solution is washed with water (2x20 ml) and brine (2x20 ml) and dried (anhyd. Na<sub>2</sub>SO<sub>4</sub>). Concentration in vacuuo and purification by flash chromatography (silica, hexanes-ethyl acetate, 7:3) furnished the aryl-N-cycloalkyl amide in 52-63% yield.

**General Procedure G. Synthesis of substituted alkanoic acids**

To a solution of alkanoic acid (1.0 g, 5 mmol) in a mixture of anhydrous THF (10 ml) and HMPA (5 ml) is added dropwise LDA (5 ml, 2 M in heptanes/THF/ethylbenzene) at -78°C. The contents are stirred for 1 h at -78°C and then at 25°C for 30 min. The reaction mixture is cooled again to -78°C and is added drop wise a solution of bromoalkane (5 mmol) in THF (5 ml). The cooling bath is removed and the contents are stirred for 12 h at 25°C. The contents of the flask are poured into cold 1N HCl (30 ml) and extracted with ethyl acetate (3x50 ml). The combined extracts are washed with brine, dried (Na<sub>2</sub>SO<sub>4</sub>) and concentrated. The residue is purified by flash chromatography (silica, 1% methanol in chloroform) to obtain the corresponding acid.

**General Procedure H. Synthesis of ureas via Acyl Azide**

To a solution of a carboxylic acid (0.5 mmol) in anhydrous dichloromethane (2 ml) are added a drop of DMF and oxalyl chloride (88 µL, 1 mmol) at 0°C. The contents are stirred for 10 min at 0°C and then at 25°C for 1 h. The volatiles are stripped off *in vacuo* and the residue is dissolved in dichloroethane (4 ml). Sodium azide (195 mg, 3 mmol) is added and the mixture is heated at 80°C for 3 h. The resulting isocyanate solution is cooled and amine (1 mmol) is added. The resulting mixture is heated at 80°C for 12 h. The solvent is removed by rotary evaporation and the residue is purified by flash chromatography [silica, ethyl acetate-dichloromethane (1:4)] to obtain the corresponding urea.

**General Procedure I. Reductive Amination**

Amine is dissolved in dry THF (0.1-1 M) in a round-bottomed flask, and then aldehyde or ketone (1 eq, or slight excess) is added to the solution and stirred for a few min at 25°C. Sodium triacetoxyborohydride (2 eq) is added and the mixture stirred at rt. The reaction mixture is then washed with saturated sodium bicarbonate (200 ml) and extracted with ethyl acetate. The organic extracts are combined, dried, and concentrated *in vacuo* to give the product secondary or tertiary amine.

**General Procedure J. Preparation of Ureas via Carbamoyl Chloride**

The secondary amine (1 eq) is dissolved dry DCM (0.1-1 M) and triethylamine (1-3 eq) is added. Then triphosgene (1-3 eq) is added at -20°C. After a few hours at 25°C a primary or secondary amine (1 eq) is added to the reaction mixture. After consumption of starting material, the mixture is subjected to aqueous workup. Concentration in vacuo afforded the product urea.

**General Procedure K. Amine Alkylation**

The amine is dissolved in dry DMF and alkali metal carbonate (1-5 eq) is added to the solution. Alkyl halide or alkyl sulfonate (1-5 eq) is added and resulting mixture is stirred for a few hours at 0°C to 100°C. The mixture was given an aqueous workup. Drying and concentration afforded the alkylated amine.

**General Procedure L. Preparation of Polymer - Supported Amine**

A primary or secondary amine (5 eq) is dissolved in DCE (1-5 M), then solid supported 2-(4-formyl-3-methoxyphenoxy) ethyl - functionalized polystyrene (1 eq, based on loading of the aldehyde functionality) is added to the solution and stirred for 30 min. Acetic acid (0.5 eq) is added to the mixture followed by addition of sodium triacetoxyborohydride (5 eq). The resin mixture is shaken at 25°C for 4-48 h, then washed with three cycles of DMF/methanol/DCM, in turn. Then the resin is dried *in vacuo* to give solid-supported primary or secondary amine.

**General Procedure M. Preparation of Polymer - Supported Carbamoyl Chloride**

The solid-supported primary or secondary 4-aminomethyl-3-methoxyphenoxy)-1-ethyl polystyrene (1 eq) is treated with triphosgene (2 eq) in the presence of DCM (0.1-3 M) and diisopropylethylamine (3-10 eq). The product on solid support is then washed with three cycles of DMF/methanol/DCM. Then the resin is dried *in vacuo* to give corresponding carbamyl chloride.

**General Procedure N. Preparation of Polymer - Supported Ureas From Carbamoyl Chloride**

Polymer supported carbamyl chloride (1.0 g, 1.46 mmol 1 eq ) is treated with primary or secondary amine (3-10 eq) in the presence of DCE (0.02-3 M)) and

- 5 diisopropylethylamine (3-20 eq). After 1-10 h, the resin is then washed with three cycles of DMF/methanol/DCM and dried *in vacuo* to afford the urea.

**General Procedure O. Alkylation of Urea, or Carbamate, or Amide Nitrogen on Polymer Support**

To the corresponding polymer supported urea, carbamate, or amide having a free NH group (1 eq) 0.117 g, 0.73 mmol) is added potassium *t*-butoxide (3-10 eq). The resin mixture is shaken for 1 h at 25°C and then alkyl halide or alkyl sulfonate 3-10 eq is added. After 16 h the polymer is then washed with three cycles of DMF/methanol/DCM and dried *in vacuo* to give the alkylated product.

**General Procedure P. Cleavage from Solid Support**

- 15 The polymer is treated with TFA solution (5-50% v/v in DCM, excess) at 25°C to cleave the product from the polymer support. Filtration and concentration *in vacuo* affords the product.

**General Procedure Q. Preparation of N,O-Dimethyl N-Hydroxycarboxamides**

Carboxylic acid (1 eq) in DCM (0.02-2 M) is treated with *N,O*- dimethylhydroxylamine hydrochloride (1 eq) and triethylamine (1 eq), DCC, EDC, or other carbodiimide reagent (1 eq) is added. After 1-24 hr, The solution is concentrated *in vacuo* and the residue is removed by filtration. Alternately, the mixture may be given an aqueous workup. The filtrate is concentrate in *vacuo*. The product is used directly or is purified by silica gel chromatography.

- 25 **General Procedure R. Preparation of Ketones from N,O-Dimethyl N-Hydroxycarboxamides**

Organolithium or organomagnesium reagent, whether prepared *in situ* or commercially obtained, is treated in THF or ether (0.02 - 1 M) with *N,O*-dimethyl N-hydroxycarboxamides (1 eq) at a temperature of from -20°C to 25°C. Once starting amide is consumed, the mixture is given an aqueous workup. Concentration *in vacuo* afforded the product ketone.

**General Procedure S1. Preparation of Secondary alcohol from Ketone**

The ketone (1 eq) in ethanol or methanol (0.02 - 2 M) treated with sodium borohydride (0.25 - 2 eq.) at 0°C - 25°C, followed by aqueous workup affords the secondary alcohol.

**5 General Procedure S2. Preparation of Secondary alcohol from Ketone**

The ketone 1 eq in THF or ether (0.02 - 2 M) is treated with an aluminum hydride reagent such as LiAlH<sub>4</sub> (0.25 - 2 eq) at - 78°C - 25°C, followed by quench and filtration, affording the secondary alcohol.

**General Procedure S3. Preparation of tertiary alcohol from Ketone**

10 The ketone(1 eq) in THF or ether (0.02 - 2 M) is treated with an organolithium or organomagnesium reagent at a temperature of - 78°C to 25°C. Aqueous workup affords the tertiary alcohol.

**General Procedure T. Preparation of Chloroformates**

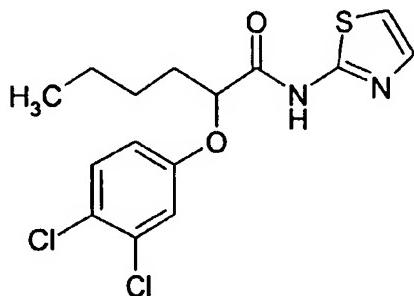
An alcohol (1 eq (0.259 g, 1.0 mmol) solution in DCM (0.02 - 2 M) 10 ml) is treated 15 with triethylamine (excess) and phosgene (1.5 eq, solution in toluene) at -20°C and stirred for 1-5 h. Excess phosgene and triethylamine is removed *in vacuo*. The product chloroformate is used immediately .

**General Procedure U. Preparation of Carbamates**

A solution of chloroformate (1 eq) in DCM (0.02 - 2 M ) is treated with tertiary amine 20 (2 -5 eq)mmol) and primary or secondary amine (1 eq). After consumption of starting material The mixture is then given an aqueous sorkup. Concentration in vacuo afforded the product carbamate.

**General Procedure X. Preparation of Ureas via Carbonyldiimidazole:**

The secondary amine (1 eq) is dissolved in DCE (0.1-1 M) and catalytic amount of 25 DMAP (5 mg) is added to the solution. Then carbonyldiimidazole (1-1.5 eq) is added and the reaction mixture is heated at 80°C for 1 h. After observation of precipitation a primary or secondary amine (1 eq) is added to the reaction mixture. After consumption of starting material, the mixture is then subjected to silica gel chromatography with ethyl acetate and hexanes mixture (3:7) to afford desired urea.

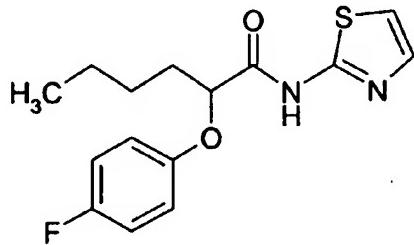
**Example 1**2-(3,4-Dichlorophenoxy)-hexanoic acid thiazol-2-yl amide

2-(3,4-Dichlorophenoxy)hexanoic acid (0.3 g, 55%) is prepared from ethyl 2-hyd-

- 5 roxyhexanoate (0.32 g, 2.0 mmol) and 3,4-dichlorophenol (0.39 g, 2.4 mmol) following general procedure A. A solution of this acid (69 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following general procedure E to obtain 2-(3,4-dichlorophenoxy)-hexanoic acid thiazol-2-yl amide (64 mg, 72%).

LCMS (*m/z*): 360 (M + H)<sup>+</sup>

- 10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.30-1.51 (m, 4H), 2.02 (m, 2H), 4.73 (t, 1H), 6.76 (dd, 1H), 7.03 (dd, 2H), 7.33 (d, 1H), 7.49 (d, 1H), 9.98 (br, 1H).

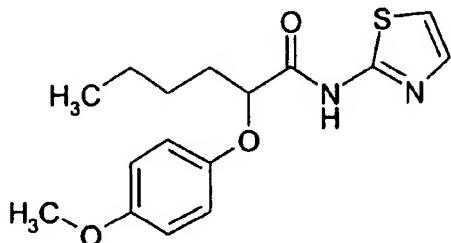
**Example 2**2-(4-Fluorophenoxy)-N-1,3-thiazol-2-ylhexanamide

15 2-(4-Fluorophenoxy)hexanoic acid (0.23 g, 52%) is prepared from ethyl 2-hydroxy-

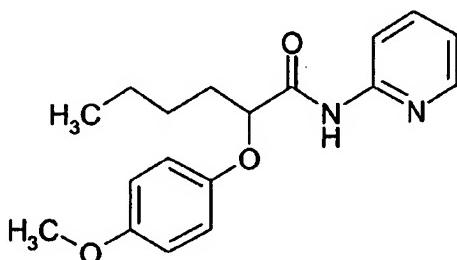
- hexanoate (0.32 g, 2.0 mmol) and 4-fluorophenol (0.27 g, 2.4 mmol) following the general procedure A. A solution of this acid (56 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylhexanamide (58 mg, 76%).

- 20 LCMS (*m/z*): 309 (M + H)<sup>+</sup>

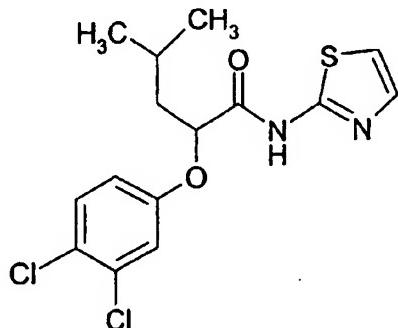
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.32-1.50 (m, 4H), 1.99 (m, 2H), 4.69 (t, 1H), 6.81-6.84 (m, 2H), 6.94-7.02 (m, 3H), 7.50 (d, 1H), 10.24 (br, 1H).

**Example 3**2-(4-Methoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide

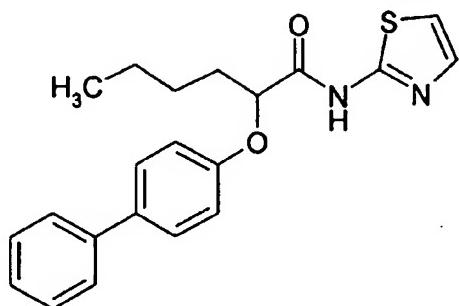
- 2-(4-Methoxyphenoxy)hexanoic acid (0.23 g, 48%) is prepared from ethyl 2-hydroxy-
- 5 hexanoate (0.32 g, 2.0 mmol) and 4-methoxyphenol (0.3 g, 2.4 mmol) following the general procedure A. A solution of this acid (60 mg, 0.25) in THF (3 ml) is reacted with 2-amino-thiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methoxy-phenoxy)-N-1,3-thiazol-2-ylhexanamide (130 mg, 82%).
- LCMS (*m/z*): 321 (M + H)<sup>+</sup>
- 10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.31-1.52 (m, 4H), 1.98 (m, 2H), 3.74 (s, 3H), 4.67 (t, 1H), 6.82 (m, 4H), 7.01 (d, 1H), 7.52 (d, 1H), 10.33 (br, 1H).

**Example 4**2-(4-Methoxyphenoxy)-N-pyridin-2-ylhexanamide

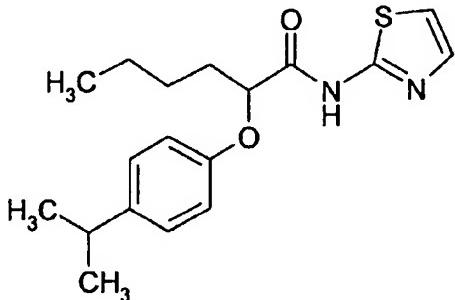
- 15 A solution of 2-(4-methoxyphenoxy)hexanoic acid (60 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methoxyphenoxy)-N-pyridin-2-ylhexanamide (58 mg, 75%).
- LCMS (*m/z*): 315 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.32-1.52 (m, 4H), 1.98 (m, 2H), 3.74 (s, 3H), 4.55 (t, 1H), 6.82 (dd, 2H), 6.90 (dd, 2H), 7.03 (m, 2H), 7.70 (t, 1H), 8.26 (m, 1H), 8.83 (br, 1H).

**Example 5**2-(3,4-Dichlorophenoxy)-4-methyl-N-1,3-thiazol-2-ylpentanamide

- 2-(3,4-dichlorophenoxy)-4-methylpentanoic acid (0.26 g, 46%) is prepared from
- 5      methyl 2-hydroxy-4-methylpentanoate (0.32 g, 2.0 mmol) and 3,4-dichlorophenol (0.39 g, 2.4 mmol) following the general procedure A. A solution of this acid (69 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenoxy)-4-methyl-N-1,3-thiazol-2-ylpentanamide (74 mg, 82%).  
LCMS (*m/z*): 359 (M + H)<sup>+</sup>
- 10     <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.99 (m, 4H), 1.80 (m, 1H), 1.93 (m, 2H), 4.74 (m, 1H), 6.71 (m, 1H), 6.96 (m, 1H), 7.05 (d, 1H), 7.30 (dd, 1H), 7.54 (s, 1H), 10.50 (br, 1H).

**Example 6**2-(1,1'-Biphenyl-4-yloxy)-N-1,3-thiazol-2-ylhexanamide

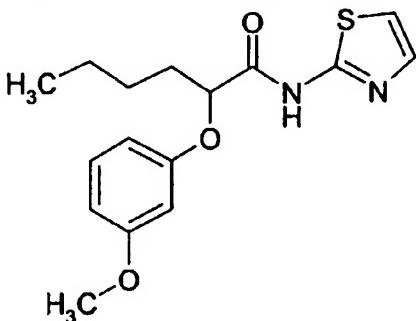
- 2-(4-phenylphenoxy)hexanoic acid (0.15 g, 26%) is prepared from ethyl 2-hydroxyhexanoate (0.32 g, 2.0 mmol) and 4-hydroxybiphenyl (0.39 g, 2.4 mmol) following the general procedure A. A solution of this acid (71 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(1,1'-biphenyl-4-yloxy)-N-1,3-thiazol-2-ylhexanamide (60 mg, 66%).
- 20    LCMS (*m/z*): 367 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.90 (t, 3H), 1.34-1.54 (m, 4H), 2.04 (m, 2H), 4.82 (t, 1H), 6.95 (dd, 2H), 7.02 (d, 1H), 7.31-7.53 (m, 8H), 10.45 (br, 1H).

**Example 7**2-(4-Isopropylphenoxy)-N-1,3-thiazol-2-ylhexanamide

2-(4-Isopropylphenoxy)hexanoic acid (0.23 g, 46%) is prepared from ethyl 2-hydroxyhexanoate (0.32 g, 2.0 mmol) and 4-isopropylphenol (0.33 g, 2.4 mmol) following the general procedure A. A solution of this acid (63 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-isopropylphenoxy)-N-1,3-thiazol-2-ylhexanamide (68 mg, 82%).

LCMS (*m/z*): 333 (M + H)<sup>+</sup>

<sup>10</sup> <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.21 (dd, 6H), 1.32-1.50 (m, 4H), 2.00 (m, 2H), 2.84 (m, 1H), 4.74 (m, 1H), 6.84 (dd, 2H), 7.00 (d, 1H), 7.14 (dd, 2H), 7.47 (d, 1H), 9.95 (br, 1H).

**Example 8**2-(3-Methoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide

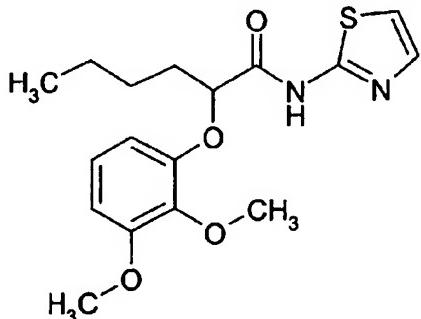
<sup>15</sup> 2-(3-Methoxyphenoxy)hexanoic acid (0.37 g, 82%) is prepared from 2-bromo-hexanoic acid (0.39 g, 2.0 mmol) and 3-methoxyphenol (0.25 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (60 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3-methoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide (61 mg, 75%).

LCMS (*m/z*): 321 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.30-1.51 (m, 4H), 1.99 (m, 2H), 3.76 (s, 3H), 4.77 (t, 1H), 6.47-6.59 (m, 3H), 7.00 (d, 1H), 7.17 (m, 1H), 7.50 (d, 1H), 10.05 (br, 1H).

**Example 9**

2-(2,3-Dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide



5

2-(2,3-Dimethoxyphenoxy)hexanoic acid (0.34 g, 64%) is prepared from 2-bromo-  
hexanoic acid (0.39 g, 2.0 mmol) and 2,3-dimethoxyphenol (0.31 g, 2.0 mmol) following the  
general procedure B. A solution of this crude acid (67 mg, 0.25 mmol) in THF (3 ml) is  
reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain

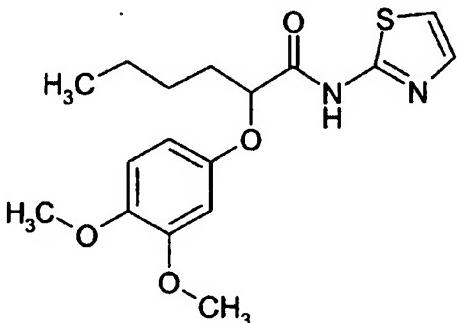
10 2-(2,3-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide (64 mg, 73%).

LCMS (*m/z*): 351 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.92 (t, 3H), 1.40 (m, 2H), 1.57 (m, 2H), 1.98-2.12 (m, 2H),  
3.84 (s, 3H), 3.97 (s, 3H), 4.71 (t, 1H), 6.60-6.66 (m, 2H), 6.95-6.98 (m, 2H), 7.49 (d, 1H),  
10.80 (br, 1H).

15 **Example 10**

2-(3,4-Dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide



2-(3,4-Dimethoxyphenoxy)hexanoic acid (0.34 g, 63%) is prepared from 2-bromo-  
hexanoic acid (0.39 g, 2.0 mmol) and 3,4-dimethoxyphenol (0.31 g, 2.0 mmol) following the  
20 general procedure B. A solution of this crude acid (67 mg, 0.25 mmol) in THF (3 ml) is

reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide (61 mg, 69%).

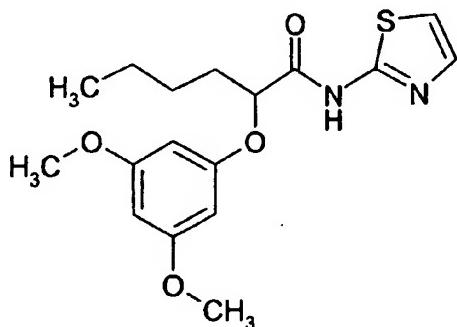
LCMS (*m/z*): 351 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  0.90 (t, 3H), 1.32-1.51 (m, 4H), 1.98-2.02 (m, 2H), 3.81 (s, 3H),

- 5 3.85 (s, 3H), 4.71 (t, 1H), 6.37 (m, 1H), 6.53 (m, 1H), 6.71 (dd, 1H), 7.00 (d, 1H), 7.48 (s, 1H), 10.00 (br, 1H).

### Example 11

#### 2-(3,5-Dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide



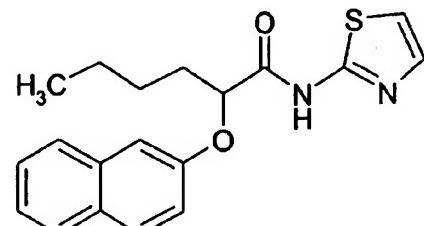
- 10 2-(3,5-Dimethoxyphenoxy)hexanoic acid (0.43 g, 81%) is prepared from 2-bromo-hexanoic acid (0.39 g, 2.0 mmol) and 3,5-dimethoxyphenol (0.31 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (67 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,5-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide (77 mg, 89%).

15 LCMS (*m/z*): 351 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  0.89 (t, 3H), 1.31-1.49 (m, 4H), 1.98-2.02 (m, 2H), 3.75 (s, 6H), 4.76 (t, 1H), 6.09 (d, 2H), 6.12 (d, 1H), 7.01 (d, 1H), 7.47 (d, 1H), 9.75 (br, 1H).

### Example 12

#### 2-(2-Naphthyoxy)-N-1,3-thiazol-2-ylhexanamide



- 20 2-(2-Naphthyoxy)hexanoic acid (0.39 g, 75%) is prepared from 2-bromohexanoic acid (0.39 g, 2.0 mmol) and 2-naphthol (0.29 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (65 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole

(60 mg, 0.6 mmol) following the general procedure E to obtain 2-(2-naphthyoxy)-N-1,3-thiazol-2-ylhexanamide (62 mg, 73%).

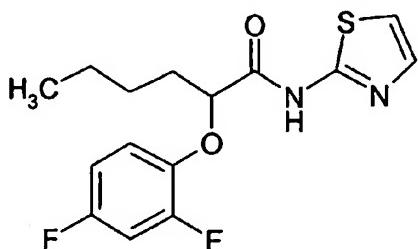
LCMS (*m/z*): 341 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.90 (t, 3H), 1.32-1.56 (m, 4H), 2.03-2.11 (m, 2H), 4.95 (t, 1H),

5 7.04 (m, 1H), 7.15-7.51 (m, 5H), 7.70 (d, 1H), 7.80 (m, 2H), 9.77 (br, 1H).

### Example 13

#### 2-(2,4-Difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide



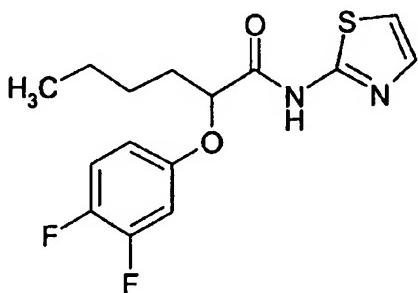
2-(2,4-Difluorophenoxy)hexanoic acid (0.34 g, 71%) is prepared from 2-bromo-  
10 hexanoic acid (0.39 g, 2.0 mmol) and 2,4-difluorophenol (0.26 g, 2.0 mmol) following the  
general procedure B. A solution of this crude acid (61 mg, 0.25 mmol) in THF (3 ml) is  
reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain  
2-(2,4-difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide (61 mg, 74%).

LCMS (*m/z*): 327 (M + H)<sup>+</sup>

15 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.25-1.54 (m, 7H), 1.98-2.05 (m, 2H), 4.69 (t, 1H), 6.76 (m,  
1H), 6.86-7.01 (m, 3H), 7.58 (m, 1H), 10.9 (br, 1H).

### Example 14

#### 2-(3,4-Difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide



20 2-(3,4-Difluorophenoxy)hexanoic acid (0.4 g, 82%) is prepared from 2-bromo-  
hexanoic acid (0.39 g, 2.0 mmol) and 3,4-difluorophenol (0.26 g, 2.0 mmol) following the  
general procedure B. A solution of this crude acid (61 mg, 0.25 mmol) in THF (3 ml) is

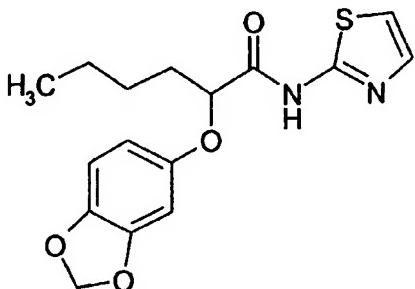
reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide (71 mg, 88%).

LCMS (*m/z*): 327 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.32-1.50 (m, 4H), 1.97-2.03 (m, 2H), 4.69 (t, 1H), 5 6.59 (m, 1H), 6.73 (m, 1H), 7.03-7.11 (m, 2H), 7.50 (m, 1H), 10.1 (br, 1H).

### Example 15

#### 2-(1,3-Benzodioxol-5-yloxy)-N-1,3-thiazol-2-ylhexanamide



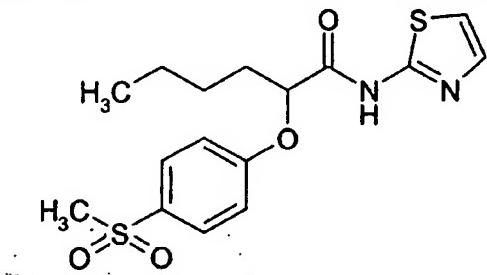
2-(3,4-Methylenedioxyphenoxy)hexanoic acid (0.42 g, 83%) is prepared from 2-bromohexanoic acid (0.39 g, 2.0 mmol) and 3,4-methylenedioxyphenol (0.28 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (63 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(1,3-benzodioxol-5-yloxy)-N-1,3-thiazol-2-ylhexanamide (75 mg, 91%).

LCMS (*m/z*): 335 (M + H)<sup>+</sup>

15 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.31-1.49 (m, 4H), 1.95 (m, 2H), 4.65 (t, 1H), 5.93 (m, 2H), 6.33 (dd, 1H), 6.51 (d, 1H), 6.68 (d, 1H), 7.00 (d, 1H), 7.47 (m, 1H), 9.89 (br, 1H).

### Example 16

#### 2-(4-Methylsulfonylphenoxy)-N-1,3-thiazol-2-ylhexanamide



20 2-(4-Methylsulfonylphenoxy)hexanoic acid (0.37 g, 66%) is prepared from 2-bromo-hexanoic acid (0.39 g, 2.0 mmol) and 4-methylsulfonylphenol (0.35 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (70 mg, 0.25 mmol) in THF (3 ml) is

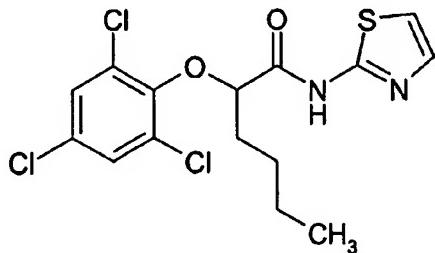
reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methylsulfonylphenoxy)-N-1,3-thiazol-2-ylhexanamide (80 mg, 88%).

LCMS (*m/z*): 369 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.90 (t, 3H), 1.35-1.52 (m, 4H), 2.07 (m, 2H), 3.02 (s, 3H), 4.87 (t, 1H), 7.02 (dd, 2H), 7.05 (d, 1H), 7.52 (d, 1H), 7.86 (m, 1H), 10.45 (br, 1H).

### Example 17

#### 2-(2,4,6-Trichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide



2-(2,4,6-Trichlorophenoxy)hexanoic acid (0.48 g, 76%) is prepared from 2-bromo-

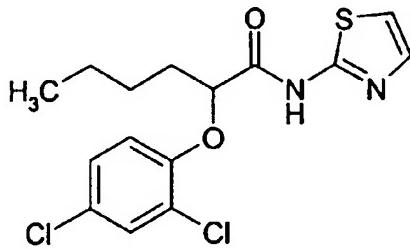
10 hexanoic acid (0.39 g, 2.0 mmol) and 2,4,6-trichlorophenol (0.4 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (80 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(2,4,6-Trichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide (77 mg, 79%).

LCMS (*m/z*): 393 (M + H)<sup>+</sup>

15 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.87 (t, 3H), 1.31 (m, 2H), 1.62 (m, 2H), 1.85-2.09 (m, 2H), 4.92 (t, 1H), 7.02 (dd, 1H), 7.26 (dd, 1H), 7.35 (d, 1H), 7.49 (d, 1H), 10.24 (br, 1H).

### Example 18

#### 2-(2,4-Dichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide



20 2-(2,4-Dichlorophenoxy)hexanoic acid (0.4 g, 72%) is prepared from 2-bromo-

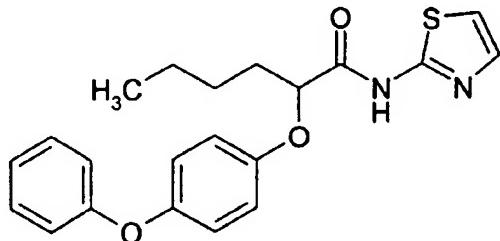
hexanoic acid (0.39 g, 2.0 mmol) and 2,4-dichlorophenol (0.33 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (69 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(2,4-dichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide (81 mg, 91%).

LCMS (*m/z*): 359 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.90 (t, 3H), 1.32-1.50 (m, 4H), 2.04-2.08 (m, 2H), 4.80 (t, 1H), 6.84 (d, 1H), 7.01 (dd, 1H), 7.18 (m, 1H), 7.42 (dd, 1H), 7.48 (dd, 1H), 9.98 (br, 1H).

### Example 19

5 2-(4-Phenoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide



2-(4-Phenoxyphenoxy)hexanoic acid (0.52 g, 87%) is prepared from 2-bromo-  
hexanoic acid (0.39 g, 2.0 mmol) and 4-phenoxyphenol (0.37 g, 2.0 mmol) following the  
general procedure B. A solution of this crude acid (75 mg, 0.25 mmol) in THF (3 ml) is

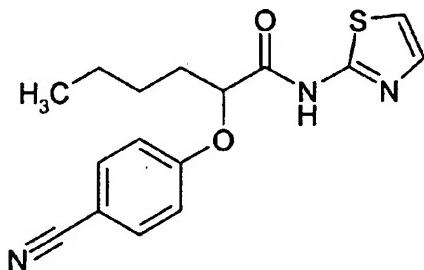
10 reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain  
2-(4-phenoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide (87 mg, 92%).

LCMS (*m/z*): 383 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.90 (t, 3H), 1.33-1.54 (m, 4H), 2.01 (m, 2H), 4.72 (t, 1H), 6.87-  
7.08 (m, 8H), 7.30 (m, 2H), 7.50 (d, 1H), 10.07 (br, 1H).

15 **Example 20**

2-(4-Cyanophenoxy)-N-1,3-thiazol-2-ylhexanamide



2-(4-Cyanophenoxy)hexanoic acid (0.35 g, 75%) is prepared from 2-bromohexanoic  
acid (0.39 g, 2.0 mmol) and 4-cyanophenol (0.24 g, 2.0 mmol) following the general

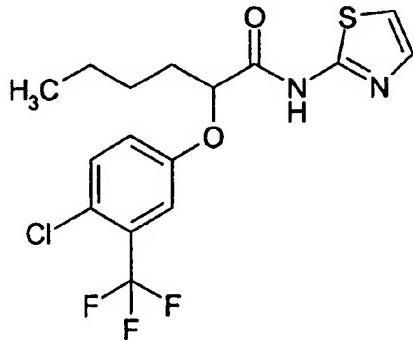
20 procedure B. A solution of this crude acid (58 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-  
aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-cyano-  
phenoxy)-N-1,3-thiazol-2-ylhexanamide (67 mg, 86%).

LCMS (*m/z*): 316 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.91 (t, 3H), 1.32-1.49 (m, 4H), 2.02-2.06 (m, 2H), 4.85 (t, 1H), 7.00 (dd, 1H), 7.04 (d, 2H), 7.47 (d, 1H), 7.61 (dd, 1H), 9.65 (br, 1H).

**Example 21**

2-(4-Chloro-3-trifluoromethylphenoxy)-N-1,3-thiazol-2-ylhexanamide



5

2-(4-Chloro-3-trifluoromethylphenoxy)hexanoic acid (0.50 g, 82%) is prepared from 2-bromohexanoic acid (0.39 g, 2.0 mmol) and 2-chloro-5-hydroxybenzotrifluoride (0.39 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (77 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general

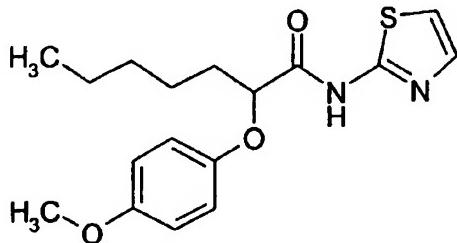
10 procedure E to obtain 2-(4-chloro-3-trifluoromethylphenoxy)-N-1,3-thiazol-2-ylhexanamide (80 mg, 82%).

LCMS (*m/z*): 393 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.91 (t, 3H), 1.35-1.49 (m, 4H), 2.00-2.04 (m, 2H), 4.79 (t, 1H), 6.99 (dd, 1H), 7.04 (d, 1H), 7.25-7.49 (m, 3H), 9.90 (br, 1H).

15 **Example 22**

2-(4-Methoxyphenoxy)-N-1,3-thiazol-2-ylheptanamide



To a mixture of 4-methoxyphenol (0.25 g, 2.0 mmol) and potassium *t*-butoxide (235 mg, 2.1 mmol) in DMF (4 ml) is added a solution of ethyl 2-bromoheptanoate (0.47 g, 2.0 mmol) in DMF (2 ml) rapidly at 0°C. The reaction mixture is stirred at 25°C for 15 h. The contents are poured into water (20 ml) and extracted with ether (2x20 ml). The combined extracts are concentrated and the residue is dissolved in THF (5 ml). To the THF solution is

added 1 N lithium hydroxide (10 ml) and the contents are stirred for 2 h. The resulting mixture is poured into cold 1 N HCl (10 ml) and extracted with ether (2x20 ml). The combined extracts are washed with brine, dried ( $\text{Na}_2\text{SO}_4$ ) and concentrated *in vacuo* to obtain the desired acid (0.43 g, 82%).

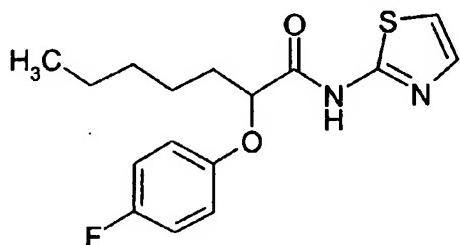
5 A solution of this crude acid (63 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methoxyphenoxy)-N-1,3-thiazol-2-ylheptanamide (65 mg, 78%).

LCMS (*m/z*): 335 ( $\text{M} + \text{H}$ )<sup>+</sup>

10  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  0.86 (t, 3H), 1.27-1.30 (m, 2H), 1.46-1.51 (m, 2H), 1.94-1.99 (m, 2H), 3.75 (s, 3H), 4.67 (t, 1H), 6.77-6.87 (m, 4H), 7.00 (dd, 1H), 7.49 (d, 1H), 10.15 (br, 1H).

### Example 23

#### 2-(4-Fluorophenoxy)-N-1,3-thiazol-2-ylheptanamide

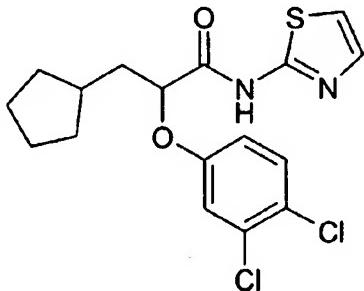


15 To a mixture of 4-fluorophenol (0.22 g, 2.0 mmol) and potassium *t*-butoxide (235 mg, 2.1 mmol) in DMF (4 ml) is added a solution of ethyl 2-bromoheptanoate (0.47 g, 2.0 mmol) in DMF (2 ml) rapidly at 0°C. The reaction mixture is stirred at 25°C for 15 h. The contents are poured into water (20 ml) and extracted with ether (2x20 ml). The combined extracts are concentrated and the residue is dissolved in THF (5 ml). To the THF solution is 20 added 1 N lithium hydroxide (10 ml) and the contents are stirred for 2 h. The resulting mixture is poured into cold 1 N HCl (10 ml) and extracted with ether (2x20 ml). The combined extracts are washed with brine, dried (anhyd  $\text{Na}_2\text{SO}_4$ ) and concentrated *in vacuo* to obtain the desired acid (0.35 g, 74%).

25 A solution of this crude acid (60 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylheptanamide (65 mg, 78%).

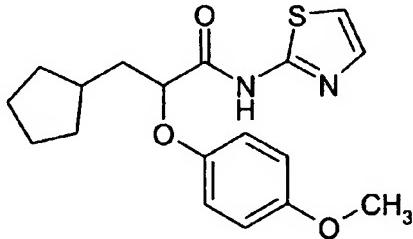
LCMS (*m/z*): 323 ( $\text{M} + \text{H}$ )<sup>+</sup>

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  0.86 (t, 3H), 1.29 (m, 4H), 1.48 (m, 2H), 1.98-2.01 (m, 2H), 4.70 (m, 1H), 6.84-7.00 (2 m, 4H), 7.01 (d, 1H), 7.48 (d, 1H), 10.00 (br, 1H).

**Example 24**2-(3,4-Dichlorophenoxy)-3-cyclopentyl-N-1,3-thiazol-2-ylpropionamide

2-(3,4-Dichlorophenoxy)-3-cyclopentylpropionic acid (0.43 g, 72%) is prepared from

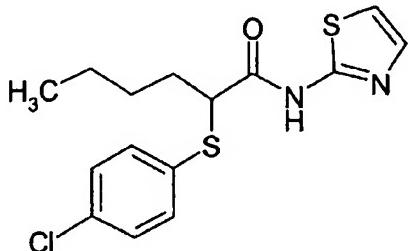
- 5 2-bromo-3-cyclopentylpropionic acid (0.44 g, 2.0 mmol) and 3,4-dichlorophenol (0.33 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (75 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide (75 mg, 78%).  
LCMS (*m/z*): 385 (M + H)<sup>+</sup>
- 10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.16 (m, 2H), 1.50-2.08 (several m, 9H), 4.73 (m, 1H), 6.71 (m, 1H), 6.96 (m, 1H), 7.05 (d, 1H), 7.33 (d, 1H), 7.48 (d, 1H), 10.50 (br, 1H).

**Example 25**2-(4-Methoxyphenoxy)-3-cyclopentyl-N-1,3-thiazol-2-ylpropionamide

- 15 2-(4-Methoxyphenoxy)-3-cyclopentyloxypropionic acid (0.36 g, 68%) is prepared from 2-bromo-3-cyclopentylpropionic acid (0.44 g, 2.0 mmol) and 4-methoxyphenol (0.25 g, 2.0 mmol) following the general procedure B. A solution of this crude acid (65 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methoxyphenoxy)-3-cyclopentyl-N-1,3-thiazol-2-ylpropionamide (73 mg, 85%).

LCMS (*m/z*): 347 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.16 (m, 2H), 1.50-2.08 (several m, 9H), 3.75 (s, 3H), 4.67 (m, 1H), 6.81 (m, 4H), 7.00 (d, 1H), 7.54 (d, 1H), 10.59 (br, 1H).

**Example 26**2-(4-Chloro-phenylsulfanyl)-hexanoic acid thiazol-2-ylamide

To a mixture of ethyl 2-hydroxyhexanoate (0.32 g, 2.0 mmol), 4-chlorobzenethiol

- 5      (0.35 g, 2.4 mmol) and triphenylphosphine (0.63 g, 2.4 mmol) in anhydrous THF (6 ml) is added dropwise diisopropyl azodicarboxylate (0.47 ml, 2.4 mmol) with stirring at 0°C. The mixture is stirred at 0°C for 1 h and then at 25°C for 8 h. The solvent is removed and the residue is purified by flash chromatography [silica, ethyl acetate-hexanes (1:20)] to afford the ethyl 2-(4-chlorophenylthio)hexanoate (0.22 g, 35%). This is dissolved in THF (4 ml) and a 1
- 10     M solution of lithium hydroxide (10 ml) is added and the resulting mixture is stirred for 2 h at 25°C. Acidification with dilute HCl followed by extraction with ether (2x20 ml) provided 2-(4-chlorophenylthio)hexanoic acid (183 mg, 91%).

A solution of this acid (64 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-amino-thiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-chloro-phenyl-

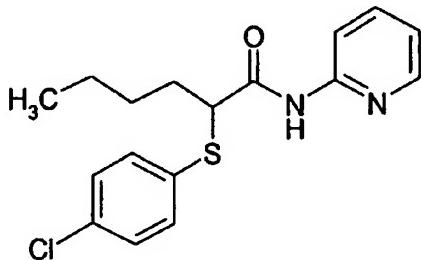
- 15     sulfanyl)-hexanoic acid thiazol-2-ylamide (74 mg, 82%).

LCMS (*m/z*): 341 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.89 (t, 3H), 1.33-1.56 (m, 4H), 1.82 (m, 1H), 2.02 (m, 1H), 3.74 (t, 1H), 7.02 (d, 1H), 7.19 (d, 2H), 7.28 (d, 2H), 7.42 (d, 1H), 11.52 (br, 1H).

**Example 27**

- 20     2-(4-Chloro-phenylsulfanyl)-hexanoic acid pyridin-2-ylamide



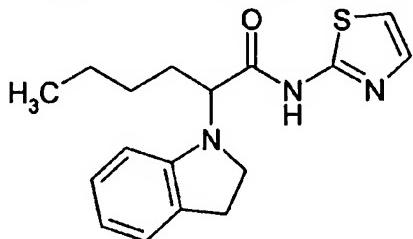
A solution of 2-(4-chlorophenylthio)hexanoic acid (64 mg, 0.25 mmol) in THF (3 ml) is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-chloro-phenylsulfanyl)-hexanoic acid pyridin-2-ylamide (70 mg, 85%).

LCMS (*m/z*): 335 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.91 (t, 3H), 1.35-1.56 (m, 4H), 1.82-1.87 (m, 1H), 1.96-2.02 (m, 1H), 3.73 (t, 1H), 7.03-7.06 (m, 1H), 7.22-7.25 (m, 2H), 7.30-7.33 (m, 2H), 7.67-7.71 (m, 1H), 8.14 (d, 1H), 8.26-8.28 (m, 1H), 8.80 (br, 1H).

5   **Example 28**

2-(Indolin-1-yl)-N-(1,3-thiazol-2-yl)hexanamide

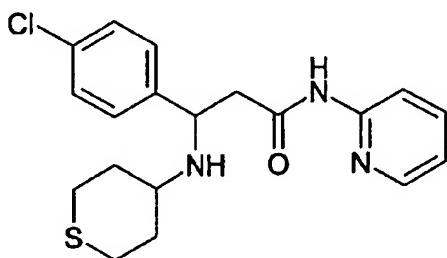


2-Bromo-N-1,3-thiazol-2-ylheptanamide was prepared from 2-bromohexanoic acid (0.19 g, 1 mmol) and 2-aminothiazole (0.1 g, 1 mmol) as described in procedure E. To the 10 reaction mixture was added indoline (0.3 g, 2.5 mmol) and heated at 80°C for 12 h. The reaction mixture was concentrated and purified by column chromatography (silica, 10-20% ethyl acetate in hexanes) to obtain 2-(indolin-1-yl)-N-(1,3-thiazol-2-yl)hexanamide (120 mg, 38%).

LCMS (*m/z*): 316 (M + H)<sup>+</sup>

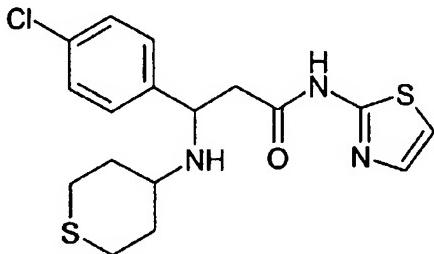
15   **Example 29**

3-(4-Chlorophenyl)-N-pyridin-2-yl-3-(tetrahydro-2H-thiopyran-4-ylamino)propanamide



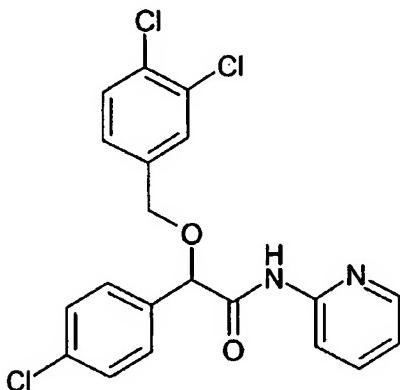
3-(4-Chlorophenyl)-N-pyridin-2-yl-3-(tetrahydro-2H-thiopyran-4-ylamino)propanamide (206 mg, 55%) is prepared from 3-N-Boc-3-(4-chlorophenyl)propionic acid (300 mg, 1 20 mmol), 2-amino pyridine (225 mg, 2.4 mmol) and 4-tetrahydrothiopyranone (127 mg, 1.1 mmol), following the general procedure F.

LCMS (*m/z*): 377 (M + 2 H)<sup>+</sup>

**Example 30****3-(4-Chlorophenyl)-3-(tetrahydro-2H-thiopyran-4-ylamino)-N-1,3-thiazol-2-ylpropanamide**

5      3-(4-Chlorophenyl)-3-(tetrahydro-2H-thiopyran-4-ylamino)-N-1,3-thiazol-2-ylpropan-  
amide (198 mg, 52%) is prepared from 3-N-Boc-3-(4-chloro phenyl)propionic acid (300 mg, 1  
mmol), 2-amino thiazole (240 mg, 2.4 ) and 4-tetrahydrothiopyranone(127 mg, 1.1 mmol),  
following the general procedure F.

LCMS (*m/z*): 383 (M + 2 H)<sup>+</sup>

**Example 31****10    2-(3,4-Dichlorobenzylxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide**

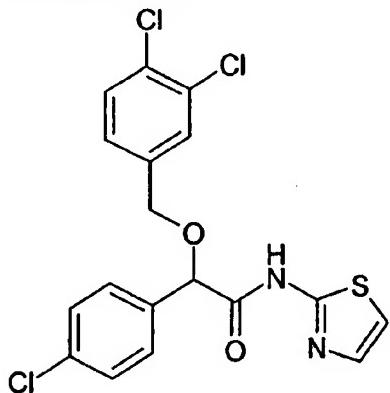
A solution of 4-chloromandalic acid methyl ester (402 mg, 2 mmol) and 3,4-dichlorobenzyl bromide (0.48 g, 2 mmol) in anhydrous ether (10 ml) is added to a suspension of silver oxide (1 g) in ether (10 ml) and stirred for 2 days. All the solids are filtered off and the  
15      filtrate is concentrated and purified by column chromatography (silica, 10% ethyl acetate in hexanes) to afford the corresponding ester. Hydrolysis of this ester is carried out as described in procedure A to afford 2-(3,4-dichlorobenzylxy)-2-(4-chlorophenyl) acetic acid (358 mg, 52%). A solution of this acid (86 mg, 0.25 mmol) in THF is reacted with 2-amino-pyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorobenzylxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide (72 mg, 68 %).

20      LCMS (*m/z*): 421 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 4.52 (dd, 2H), 4.90 (s, 1H), 7.06 (m, 1H), 7.19 (dd, 1H), 7.37-7.44 (m, 6H), 7.68 (m, 1H), 8.15 (dd, 1H), 8.29 (m, 1H), 9.06 (br, 1H).

**Example 32**

2-(3,4-Dichlorobenzyl)oxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide



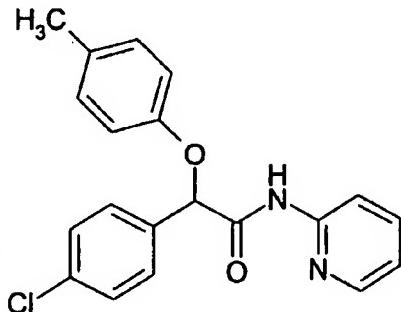
5

2-(3,4-Dichlorobenzyl)oxy)-2-(4-chlorophenyl)acetic acid (86 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorobenzyl)oxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide (68 mg, 65%).

10 LCMS (*m/z*): 427 (M + H)<sup>+</sup>.

**Example 33**

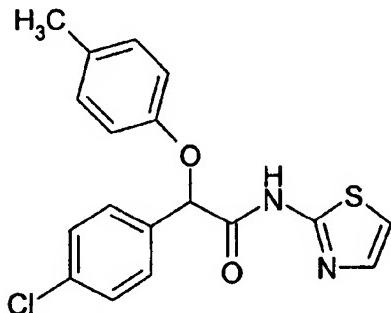
2-(4-Chlorophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide



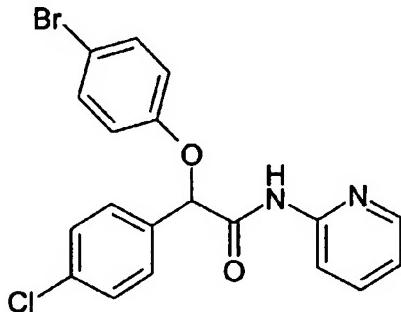
2-(4-Methyl-phenoxy)-2-(4-chlorophenyl) acetic acid (276 mg, 50%) is prepared from

15 4-chloro-mandalic acid methyl ester (402 mg, 2 mmol), 4-methyl phenol (260 mg 2.4 mmol) following the general procedure A. A solution of this acid (70 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-chlorophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide (63 mg, 72%).

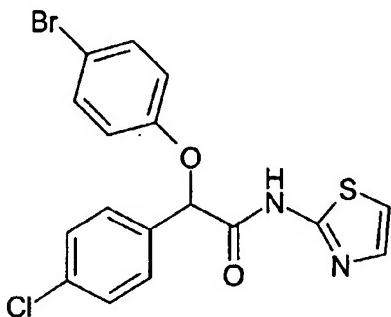
LCMS (*m/z*): 354 (M+H)<sup>+</sup>

**Example 34**2-(4-Chlorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide

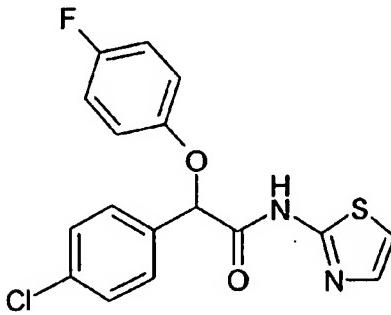
- A solution of 2-(4-methyl-phenoxy)-2-(4-chlorophenyl) acetic acid (70 mg, 0. 25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-chlorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide (66 mg, 74%).
- LCMS (*m/z*): 359 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 2.26 (s, 3H), 5.70 (s, 1H), 6.81 (d, 2H), 7.01 (d, 1H), 7.05-7.08 (dd, 2H), 7.34-7.36 (dd, 2H), 7.47-7.50 (m, 3 H), 10.06 (br, 1H).

**Example 35**2-(4-Bromophenoxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide

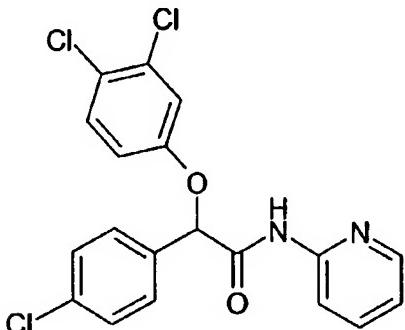
- 2-(4-Bromophenoxy)-2-(4-chlorophenyl) acetic acid (450 mg, 54%) is prepared from 4-chloromandelic acid methyl ester (402 mg, 2 mmol), 4-bromophenol (415 mg, 2.4 mmol) following general procedure A. A solution of this acid (104 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0. 6 mmol) following the general procedure E to obtain 2-(4-bromophenoxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide (75 mg, 72%).
- LCMS (*m/z*): 418 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.59 (s, 1H), 6.84 (dd, 2H), 7.05-7.09 (dd, 1H), 7.31-7.38 (dd, 4H), 7.48-7.50 (dd, 2H), 7.67-7.72 (m, 1H), 8.17 (d, 1H), 8.29-8.30 (dd, 1H), 9.04 (br, 1H).

**Example 36**2-(4-Bromophenoxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide

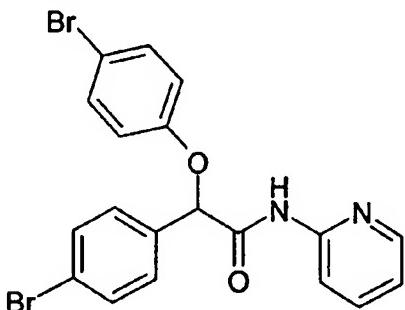
- A solution of 2-(4-bromophenoxy)-2-(4-chlorophenyl) acetic acid (104 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.60 mmol) following the general procedure E to obtain 2-(4-bromophenoxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide (78 g, 74%).
- LCMS (*m/z*): 424 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.70 (s, 1H), 6.81 (d, 1H), 7.02-7.03 (d, 1H), 7.35-7.40 (m, 4H), 7.45-7.48 (m, 3H), 10.13 (br, 1H).

**Example 37**2-(4-Chlorophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide

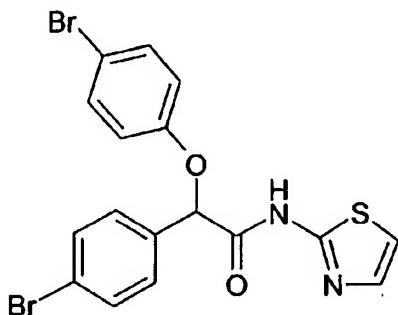
- 2-(4-Fluorophenoxy)-2-(4-chlorophenyl) acetic acid (296 mg, 53%) is prepared from 4-chloro-mandalic acid methyl ester (402 mg, 2 mmol), 4-fluorophenol (269 mg, 2.4 mmol) following the general procedure A. A solution of this acid (70 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.60 mmol) following the general procedure E to obtain 2-(4-chlorophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide (71 mg, 78%).
- LCMS (*m/z*): 363 (M+ H)<sup>+</sup>

**Example 38**2-(4-Chlorophenyl)-2-(3,4-dichlorophenoxy)-N-pyridin-2-ylacetamide

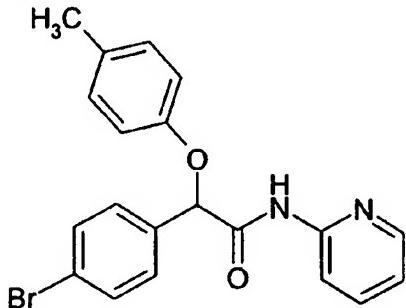
- 2-(3,4-Dichlorophenoxy)-2-(4-chlorophenyl) acetic acid (363 mg, 55%) is prepared  
 5 from 4-chloro-mandalic acid methyl ester (402 mg, 2 mmol), 3,4-dichlorophenol (390 mg 2.4 mmol) following the general procedure A. A solution of this acid (83 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.60 mmol) following the general procedure E to obtain 2-(4-chlorophenyl)-2-(3,4-dichlorophenoxy)-N-pyridin-2-ylacetamide (82 mg, 80%).  
 LCMS (*m/z*): 408 ( $\text{M} + \text{H}$ )<sup>+</sup>  
 10 <sup>1</sup>H NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  4.92 (s, 1H), 7.05-7.09 (m, 1H), 7.05 (d, 1H), 7.05-7.08 (dd, 2H), 7.734-7.36 (dd, 2H), 7.747-7.50 (m, 2H), 10.06 (br, 1H).

**Example 39**2-(4-Bromophenoxy)-2-(4-bromophenyl)-N-pyridin-2-ylacetamide

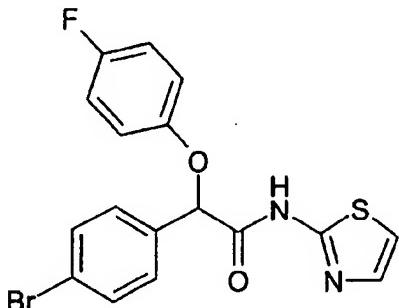
- 2-(4-Bromophenoxy)-2-(4-bromophenyl) acetic acid (461 mg, 60%) is prepared from  
 15 4-bromomandalic acid methyl ester (490 mg, 2 mmol) and 4-bromophenol (415 mg, 2.4 mmol) following the general procedure A. A solution of this acid (96 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.60 mmol) following the general procedure E to obtain 2-(4-bromophenoxy)-2-(4-bromophenyl)-N-pyridin-2-ylacetamide (104 mg 90%).  
 20 LCMS (*m/z*): 463 ( $\text{M} + \text{H}$ )<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  5.57 (s, 1H), 6.84 (d, 2H), 7.06-7.09 (t, 1H), 7.37 (d, 2H), 7.43 (d, 2H), 7.51 (d, 2H), 7.78-7.72 (t, 1H), 8.18 (d, 1H), 8.29 (d, 1H), 9.03 (s, 1H).

**Example 40**2-(4-Bromophenoxy)-2-(4-bromophenyl)-N-1,3-thiazol-2-ylacetamide

- A solution of 2-(4-bromophenoxy)-2-(4-bromophenyl) acetic acid (96 mg, 0.25 mmol)  
 5 in THF is reacted with 2-aminothiazole (60 mg, 0.60 mmol) following the general procedure E  
 to obtain 2-(4-bromophenoxy)-2-(4-bromophenyl)-N-1,3-thiazol-2-ylacetamide (103 g, 88%).  
 LCMS (*m/z*): 469 (M+ H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.68 (s, 1H), 6.76-6.78 (dd, 2H), 7.02 (d, 1H), 7.35 (d, 2H),  
 7.37 (d, 2H), 7.42 (d, 1H), 7.52 (d, 2H), 10.36 (br, 1H).

**10 Example 41**2-(4-Bromophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide

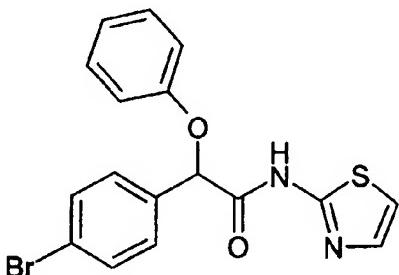
- 2-(4-Methylphenoxy)-2-(4-bromophenyl) acetic acid (372 mg, 58%) is prepared from  
 4-bromomandelic acid methyl ester (490 mg, 2 mmol), 4-methylphenol (260 mg, 2.4 mmol)  
 15 following the general procedure A. A solution of this acid (80 mg, 0.25 mmol) in THF is  
 reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain  
 2-(4-bromophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide (89 mg, 90%).  
 LCMS (*m/z*): 398 (M+ H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 2.27 (s, 3H), 5.58 (s, 1H), 6.85 (d, 2H), 7.07 (d, 3H), 7.45-7.52  
 20 (m, 4H), 7.69 (t, 1H), 8.19 (d, 1H), 8.29 (d, 1H), 9.11 (s, 1H).

**Example 42**2-(4-Bromophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide

2-(4-Fluorophenoxy)-2-(4-bromophenyl) acetic acid (472 mg, 58%) is prepared from

- 5 4-bromomandelic acid methyl ester (490 mg, 2 mmol) and 4-fluorophenol (268 mg, 2.4 mmol) following the general procedure A. A solution of this acid (81 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 6.0 mmol) following the general procedure E to obtain 2-(4-bromophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide (73g, 72%).

LCMS (*m/z*): 408 (M+ H)<sup>+</sup>

**10 Example 43**2-(4-Bromophenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide

2-Phenoxy-2-(4-bromophenyl) acetic acid (319 mg, 52%) is prepared from 4-bromo-

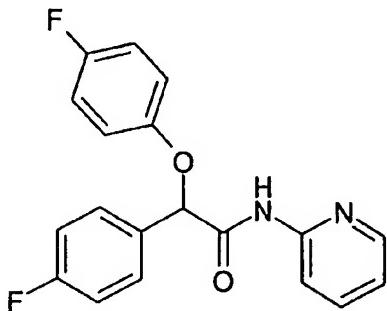
- mandelic acid methyl ester (490 mg, 2 mmol), phenol (226 mg, 2.4mmol) following the

- 15 general procedure A. A solution of this acid (76.78 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60mg, 0.6 mmol) following the general procedure E to obtain 2-(4-bromo-phenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide (82 mg, 85%).

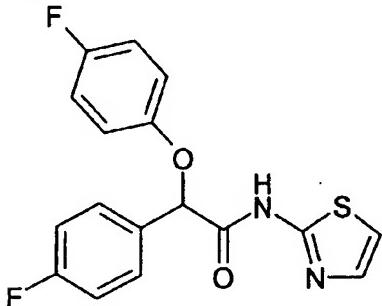
LCMS (*m/z*): 390 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.73 (s, 1H), 6.88-6.90 (dd, 2H), 7.01-7.04 (m, 2H), 7.24-7.28

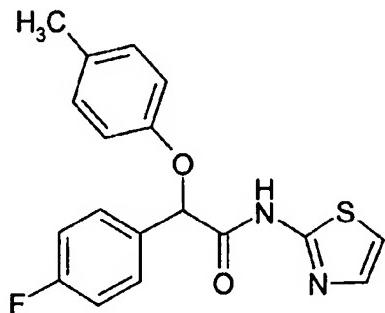
- 20 (t, 2H), 7.43 (d, 2H), 7.48-7.49 (dd, 1H), 7.50 (d, 2H), 10.50 (br, 1H).

**Example 44**2-(4-Fluorophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide

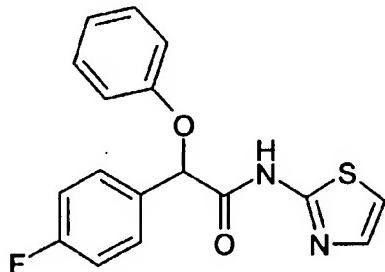
- 2-(4-Fluorophenoxy)-2-(4-fluorophenyl) acetic acid (317 mg, 60%) is prepared from
- 5 4-fluoromandelic acid methyl ester (368 mg, 2 mmol) and 4-fluorophenol (268 mg, 2.4 mmol) following the general procedure A. A solution of this acid (66 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (5 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-Fluorophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide (73 mg, 76%).
- LCMS (*m/z*): 341 (M + H)<sup>+</sup>

**10 Example 45**2-(4-Fluorophenoxy)-2-(4-fluorophenyl)-N-1,3-thiazol-2-ylacetamide

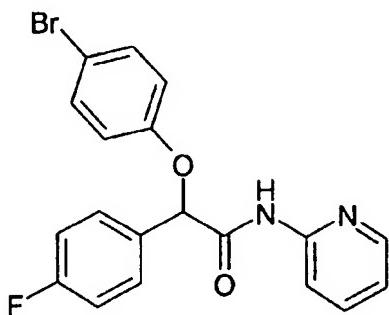
- A solution of 2-(4-fluorophenoxy)-2-(4-fluorophenyl) acetic acid (66 mg g, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general
- 15 procedure E to obtain 2-(4-Fluorophenoxy)-2-(4-fluorophenyl)-N-1,3-thiazol-2-ylacetamide (73 mg, 84%).
- LCMS (*m/z*): 347 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.72 (d, 1H), 6.85 (m, 2H), 6.95 (m, 2H), 7.02 m, 1H), 7.08 (m, 2H), 7.50 (m, 2H), 7.67 (m, 1H), 10.42 (br, 1H).

**Example 46**2-(4-Fluorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide

- 2-(4-Methylphenoxy)-2-(4-fluorophenyl) acetic acid (264 mg, 50%) is prepared from 5 4-fluoromandalic acid methyl ester (368 mg, 2 mmol) and 4-methylphenol (259 mg, 2.4 mmol) following the general procedure A. A solution of this acid (66 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-fluorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide (69 mg, 80%).  
LCMS (*m/z*): 347 (M + H)<sup>+</sup>

**10 Example 47**2-(4-Fluorophenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide

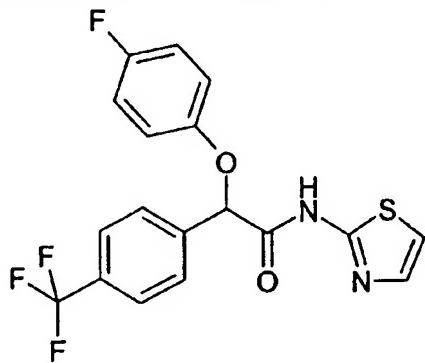
- A solution of 2-phenoxy-2-(4-fluorophenyl) acetic acid (62 mg 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 15 2-(4-fluorophenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide (62 mg, 75%).  
LCMS (*m/z*): 329 (M + H)<sup>+</sup>

**Example 48**2-(4-Bromophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide

2-(4-Bromophenoxy)-2-(4-fluorophenyl) acetic acid (338 mg, 52%) is prepared from

- 5 4-fluoromandelic acid methyl ester (368 mg, 2 mmol) and 4-bromophenol (415mg, 2.4 mmol) following the general procedure A. A solution of this acid (81 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-bromophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide (86 mg, 86%).

LCMS (*m/z*): 402 (M + H)<sup>+</sup>

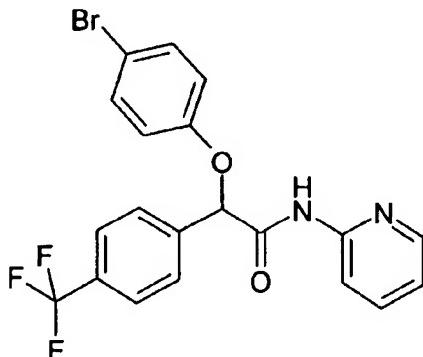
**10 Example 49**2-(4-Fluorophenoxy)-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide

2-(4-Fluorophenoxy)-2-(4-trifluoromethylphenyl) acetic acid (390 mg, 62%) is

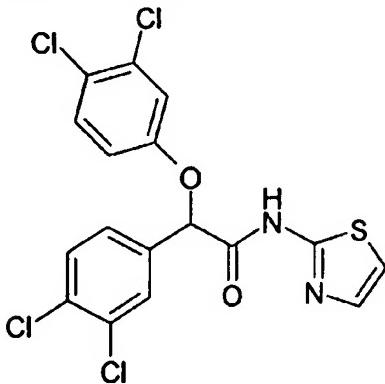
- prepared from 4-trifluoromethylmandelic acid methyl ester (468 mg, 2 mmol) and 4-fluorophenol (269 mg, 2.4 mmol) following the general procedure A. A solution of this acid (79 mg, 0.5 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-fluorophenoxy)-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]-acetamide (87 mg, 88%).

LCMS (*m/z*): 397 (M + H)<sup>+</sup>

- 20 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 5.67 (s, 1H), 6.83 (m, 2H), 6.93 (m, 2H), 7.01 (m, 1H), 7.07 (m, 2H), 7.49 (m, 3H), 10.60 (br, 1H).

**Example 50**2-(4-Bromophenoxy)-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide

- 2-(4-Bromophenoxy)-2-(4-trifluoromethylphenyl) acetic acid (405 mg, 54%) is prepared from 4-trifluoromethylmandelic acid methyl ester (468 mg, 2 mmol) and 4-bromophenol (415 mg, 2.4 mmol) following the general procedure A. A solution of this acid (94 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-bromophenoxy)-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide (102 mg, 90%).
- LCMS (*m/z*): 452 (M + H)<sup>+</sup>

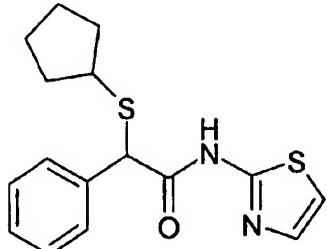
**Example 51**2-(3,4-Dichlorophenoxy)-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-ylacetamide

- 2-(3,4-Dichlorophenoxy)-2-(3,4-dichlorophenyl)acetic acid (400 mg, 55%) is prepared from 3,4-dichloromandalic acid methyl ester (468 mg, 2 mmol) and 3,4-dichlorophenol (389 mg, 2.4 mmol) following the general procedure A. A solution of this acid (91 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenoxy)-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-ylacetamide (72 mg, 65 %).
- LCMS (*m/z*): 447 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 4.94 (s, 1H), 7.07 (d, 1H), 7.14-7.16 (dd, 1H), 7.23 (d, 1H), 7.25 (d, 1H), 7.32 (d, 1H), 7.41 (d, 1H), 7.44-7.45 (dd, 1H), 7.53 (d, 1H), 11.04 (br, 1H).

### Example 52

#### 2-Cyclopentylsulfanyl-2-phenyl-N-1,3-thiazol-2-yl-acetamide



5

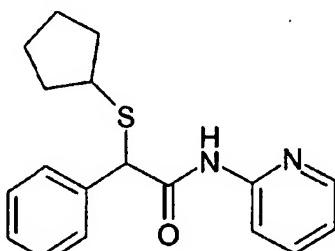
2-Cyclopentylthio-2-phenylacetic acid (330 mg, 70%) is prepared from 2-bromo-phenylacetic acid methyl ester (458 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (59 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-phenyl-N-1,3-thiazol-2-yl-acetamide (63 mg, 79%).

10 LCMS (*m/z*): 319 (M+ 1H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.55 (m, 4H), 1.72 (m, 2H), 1.98 (m, 2H), 3.11 (m, 1H), 4.80 (s, 1H), 7.00 (d, 1H), 7.26-7.36 (m, 5H), 8.38 (dd, 1H), and 10.9 (br, 1H).

### Example 53

#### 2-Cyclopentylsulfanyl-2-phenyl-N-pyridin-2-yl-acetamide



A solution of 2-cyclopentylthio-2-phenylacetic acid (59 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-phenyl-N-pyridin-2-yl-acetamide (59 mg, 75%).

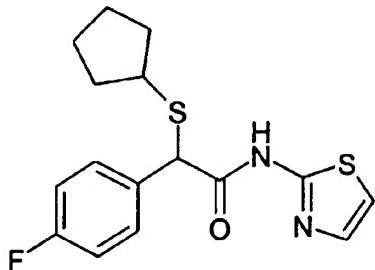
20 LCMS (*m/z*): 313 (M + H)<sup>+</sup>

LCMS (*m/z*): 314 (M+ 2H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.56-1.60 (m, 4H), 1.76 (m, 2H), 2.03 (m, 2H), 3.15 (m, 1H), 4.71 (s, 1H), 7.06 (dd, 1H), 7.26-7.36 (m, 5H), 7.70 (t, 1H), 8.21 (d, 1H), 8.29 (dd, 1H), and 9.26 (br, 1H).

**Example 54**

5 2-Cyclopentylsulfanyl-2-(4-fluorophenyl)-N-1,3-thiazol-2-yl-acetamide



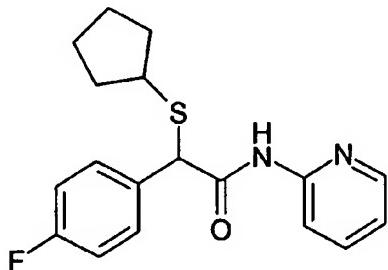
2-Cyclopentylthio-2-(4-fluorophenyl)acetic acid (345 mg, 68%) is prepared from 2-bromo-2-(4-fluorophenyl)acetic acid methyl ester (494 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (64 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-fluorophenyl)-N-1,3-thiazol-2-yl-acetamide (59 mg, 70%).

LCMS (*m/z*): 337 (M + H)<sup>+</sup>

1H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.62 (m, 4H), 1.68-1.78 (m, 2H), 1.94-2.04 (m, 2H), 3.06-3.15 (m, 1H), 4.79 (d, 1H), 7.01-7.05 (m, 2H), 7.37-7.41 (m, 1H), 7.48-7.51 (m, 1H), 7.54 (d, 1H), 7.59 (d, 1H), 10.79 (br, 1H).

**Example 55**

2-Cyclopentylsulfanyl-2-(4-fluorophenyl)-N-pyridin-2-yl-acetamide



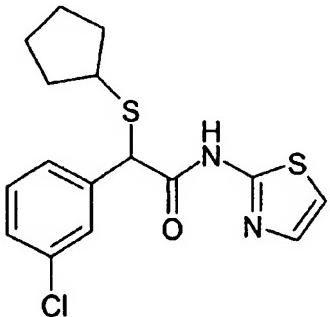
20 A solution of 2-cyclopentylthio-2-(4-fluorophenyl)acetic acid (64 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-fluorophenyl)-N-pyridin-2-yl-acetamide (60 mg, 72%).

LCMS (*m/z*): 331 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.62 (m, 4H), 1.69-1.80 (m, 2H), 1.87-2.08 (m, 2H), 3.09-3.16 (m, 1H), 4.69 (s, 1H), 7.01-7.07 (m, 3H), 7.40-7.43 (m, 2H), 7.70-7.72 (m, 1H), 8.19 (d, 1H), 8.29-8.31 (m, 1H), 9.26 (br, 1H).

### Example 56

5 2-Cyclopentylsulfanyl-2-(3-chlorophenyl)-N-1,3-thiazol-2-yl-acetamide



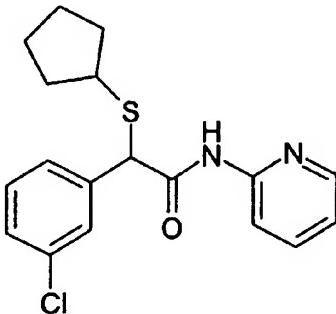
2-Cyclopentylthio-2-(3-chlorophenyl)acetic acid (351 mg, 65%) is prepared from 2-bromo-2-(3-chlorophenyl)acetic acid methyl ester (527 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-chlorophenyl)-N-1,3-thiazol-2-yl-acetamide (63 mg, 72%).

LCMS (*m/z*): 353 (M + H)<sup>+</sup>

10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.60 (m, 4H), 1.68-1.76 (m, 2H), 1.94-2.04 (m, 2H), 3.06-3.14 (m, 1H), 4.74 (s, 1H), 7.04-7.05 (d, 1H), 7.27-7.29 (m, 3H), 7.42 (s, 1H), 7.49-7.50 (d, 1H), 10.88 (br, 1H).

### Example 57

15 2-Cyclopentylsulfanyl-2-(3-chlorophenyl)-N-pyridin-2-yl-acetamide



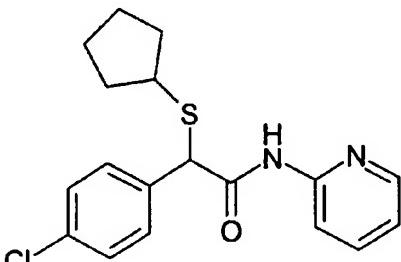
A solution of 2-cyclopentylthio-2-(3-chlorophenyl)acetic acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-chlorophenyl)-N-pyridin-2-yl-acetamide (59 mg, 68%).

LCMS (*m/z*): 347 (M + H)<sup>+</sup>

5     <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.52-1.64 (m, 4H), 1.70-1.84 (m, 2H), 1.89-2.08 (m, 2H), 3.09-3.15 (m, 1H), 4.74 (s, 1H), 7.02-7.10 (m, 3H), 7.40-7.42 (m, 2H), 7.70-7.72 (m, 1H), 8.19 (d, 1H), 8.32-8.33 (m, 1H), 9.34 (br, 1H).

### Example 58

#### 2-Cyclopentylsulfanyl-2-(4-chlorophenyl)phenyl-N-pyridin-2-yl-acetamide



10

2-Cyclopentylthio-2-(4-chlorophenyl)acetic acid (390 mg, 72%) is prepared from 2-bromo-2-(4-chlorophenyl)acetic acid methyl ester (528 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-chlorophenyl)-N-pyridin-2-yl-acetamide (62 mg, 72%).

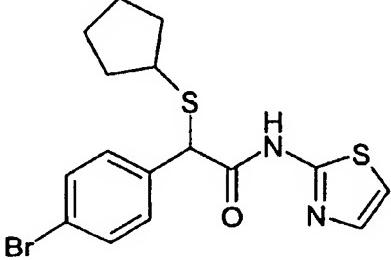
15

LCMS (*m/z*): 347 (M + H)<sup>+</sup>

1H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.52-1.63 (m, 4H), 1.72-1.85 (m, 2H), 1.89-2.10 (m, 2H), 3.09-3.16 (m, 1H), 4.72 (s, 1H), 7.02-7.09 (m, 3H), 7.42-7.44 (m, 2H), 7.71-7.73 (m, 1H), 8.19 (d, 1H), 8.31-8.32 (m, 1H), 9.25 (br, 1H).

### Example 59

#### 2-Cyclopentylsulfanyl-2-(4-bromophenyl)-N-1, 3-thiazol-2-yl-acetamide



2-Cyclopentylthio-2-(4-bromophenyl)acetic acid (441 mg, 70%) is prepared from 2-bromo-2-(4-bromophenyl)acetic acid methyl ester (616 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (79 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-bromophenyl)-N-1,3-thiazol-2-yl-acetamide (71 mg, 72%).

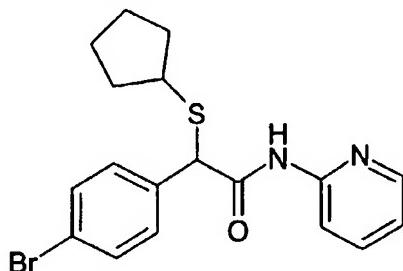
LCMS (*m/z*): 398 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.61 (m, 4H), 1.68-1.76 (m, 2H), 1.96-2.02 (m, 2H), 3.07-3.12 (m, 1H), 4.74 (s, 1H), 7.02 (d, 1H), 7.28-7.30 (dd, 1H), 7.37-7.44 (m, 1H), 7.49-7.52 (m, 1H), 7.52 (d, 1H), 7.59 (d, 1H), 10.65 (br, 1H).

10

#### Example 60

##### 2-Cyclopentylsulfanyl-2-(4-bromophenyl)-N-pyridin-2-yl-acetamide



A solution of 2-cyclopentylthio-2-(4-bromophenyl)acetic acid (79 mg, 0.25 mmol) in

15 THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-bromophenyl)-N-pyridin-2-yl-acetamide (73 mg, 75%).

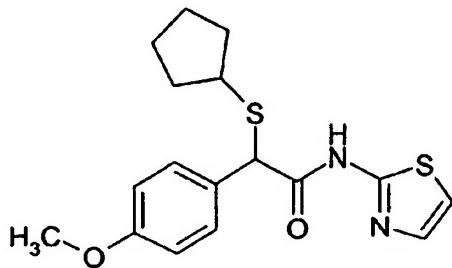
LCMS (*m/z*): 392 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.64 (m, 4H), 1.69-1.83 (m, 2H), 1.87-2.10 (m, 2H), 3.09-3.17 (p, 1H), 4.65 (s, 1H), 7.05-7.08 (dd, 1H), 7.31-7.36 (dd, 2H), 7.45-7.48 (m, 2H), 7.68-

20 7.72 (m, 1H), 8.18 (d, 1H), 8.29-8.30 (m, 1H), 9.23 (br, 1H).

#### Example 61

##### 2-Cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-1,3-thiazol-2-yl-acetamide



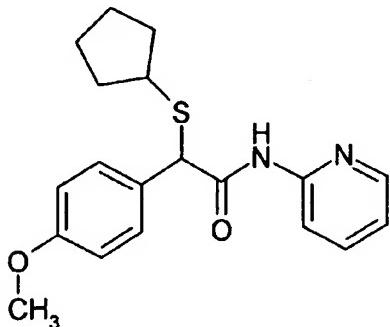
2-Cyclopentylthio-2-(4-methoxyphenyl)acetic acid (319 mg, 60%) is prepared from 4-methoxymandelic acid methyl ester (392 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure D. A solution of this acid (67 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-1,3-thiazol-2-yl-acetamide (65 mg, 75%).

LCMS (*m/z*): 349 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.46-1.63 (m, 4H), 1.68-1.78 (m, 2H), 1.93-2.06 (m, 2H), 3.06-3.13 (m, 1H), 3.78 (s, 3H), 4.75 (s, 1H), 6.84-6.88 (m, 2H), 7.00-7.02 (dd, 1H), 7.31-7.34 (m, 2H), 7.46-7.48 (dd, 1H), 10.41 (br, 1H).

## 10 Example 62

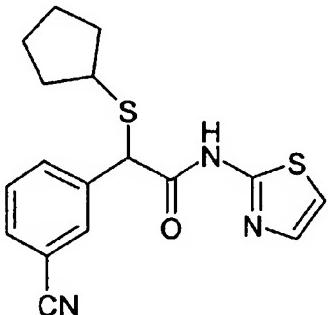
### 2-Cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-pyridin-2-yl-acetamide



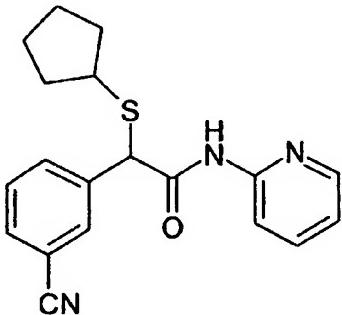
A solution of 2-cyclopentylthio-2-(4-methoxyphenyl)acetic acid (67 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-pyridin-2-yl-acetamide (60 mg, 70%).

LCMS (*m/z*): 343 (M + H)<sup>+</sup>

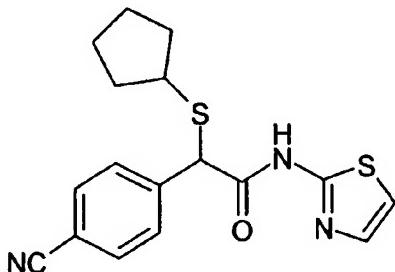
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.66 (m, 4H), 1.69-1.81 (m, 2H), 1.86-2.07 (m, 2H), 3.09-3.16 (m, 1H), 3.77 (s, 3H), 4.67 (s, 1H), 6.85-6.87 (m, 2H), 7.03-7.04 (m, 1H), 7.25-7.38 (m, 2H), 7.66-7.71 (m, 1H), 8.20 (d, 1H), 8.28-8.30 (m, 1H), 9.14 (br, 1H).

**Example 63**2-Cyclopentylsulfanyl-2-(3-cyanophenyl)-N-1, 3-thiazol-2-yl-acetamide

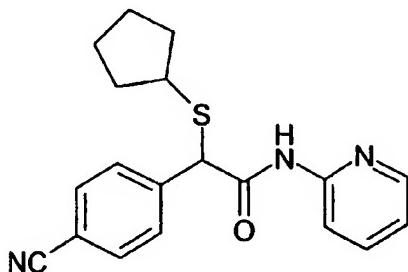
- 2-Cyclopentylthio-2-(3-cyanophenyl)acetic acid (323 mg, 62%) is prepared from 3-cyanomandelic acid methyl ester (382 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure D. A solution of this acid (65 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-cyanophenyl)-N-1,3-thiazol-2-yl-acetamide (64 mg, 74%).  
 LCMS (*m/z*): 344 (M + H)<sup>+</sup>
- 10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.61 (m, 4H), 1.68-1.78 (m, 2H), 1.91-2.20 (m, 2H), 3.05-3.12 (m, 1H), 4.81 (s, 1H), 7.07-7.08 (d, 1H), 7.45-7.47 (t, 1H), 7.50-7.51 (d, 1H), 7.58-7.60 (d, 1H), 7.68-7.70 (d, 1H), 7.76 (s, 1H), 11.28 (br, 1H).

**Example 64**2-Cyclopentylsulfanyl-2-(3-cyanophenyl)-N-pyridin-2-yl-acetamide

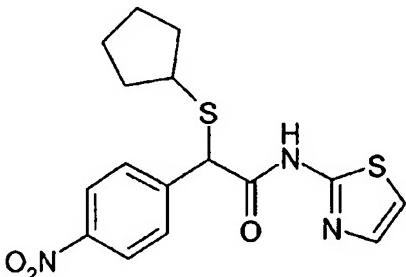
- 15 A solution of 2-cyclopentylthio-2-(3-cyanophenyl)acetic acid (65 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-cyanophenyl)-N-pyridin-2-yl-acetamide (61 mg, 72%).  
 LCMS (*m/z*): 338 (M + H)<sup>+</sup>
- 20 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.51-1.62 (m, 4H), 1.73-1.80 (m, 2H), 1.92-2.08 (m, 2H), 3.09-3.17 (m, 1H), 4.71 (s, 1H), 7.08-7.11 (m, 2H), 7.43-7.47 (m, 1H), 7.57-7.60 (m, 1H), 7.68-7.75 (m, 3H), 8.19 (d, 1H), 8.30-8.32 (m, 1H), 9.44 (br, 1H).

**Example 65**2-Cyclopentylsulfanyl-2-(4-cyanophenyl)-N-1, 3-thiazol-2-yl-acetamide

- 2-Cyclopentylthio-2-(4-cyanophenyl)acetic acid (313 mg, 60%) is prepared from 4-cyanomandelic acid methyl ester (382 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure D. A solution of this acid (65 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-cyanophenyl)-N-1,3-thiazol-2-yl-acetamide (58 mg, 68%).
- LCMS (*m/z*): 344 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.46-1.57 (m, 4H), 1.72-1.78 (m, 2H), 1.94-2.04 (m, 2H), 3.04-3.12 (m, 1H), 4.82 (s, 1H), 7.02-7.04 (m, 2H), 7.42-7.44 (m, 1H), 7.57 (d, 1H), 7.63-7.66 (dd, 1H), 7.80-7.84 (m, 1H), 8.21-8.22 (m, 1H), 10.41 (br, 1H).

**Example 66**2-Cyclopentylsulfanyl-2-(4-cyanophenyl)-N-pyridin-2-yl-acetamide

- A solution of 2-(cyclopentylthio)-2-(4-cyanophenyl)acetic acid (65 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-cyanophenyl)-N-pyridin-2-yl-acetamide (67 mg, 80%).
- LCMS (*m/z*): 338 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.54-1.61 (m, 4H), 1.70-1.76 (m, 2H), 1.88-2.06 (m, 2H), 3.09-3.16 (m, 1H), 4.72 (s, 1H), 7.07-7.10 (m, 2H), 7.55-7.57 (m, 2H), 7.62-7.64 (m, 1H), 7.69-7.74 (m, 1H), 8.16 (d, 1H), 8.29-8.31 (m, 1H), 9.32 (br, 1H).

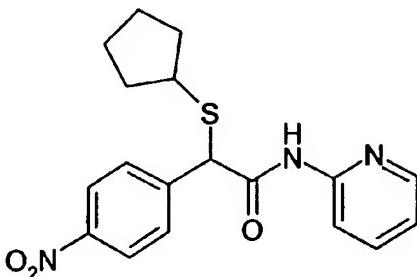
**Example 67**2-Cyclopentylsulfanyl-2-(4-nitrophenyl)-N-1,3-thiazol-2-yl-acetamide

2-Cyclopentylthio-2-(4-nitrophenyl)acetic acid (270 mg, 48%) is prepared from 2-

5 bromo-2-(4-nitrophenyl)acetic acid methyl ester (548 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (70 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-nitrophenyl)-N-1,3-thiazol-2-yl-acetamide (67 mg, 74%).

10 LCMS (*m/z*): 364 (M+ H)<sup>+</sup>

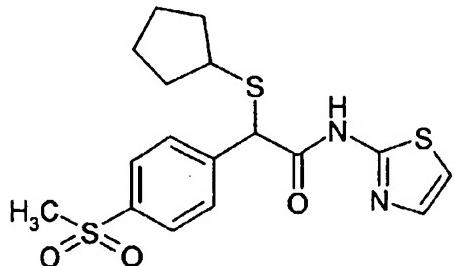
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.26 (m, 4H), 1.40 (m, 2H), 1.66 (m, 2H), 3.44 (m, 1H), 4.87 (s, 1H), 7.03 (d, 1H), 7.42 (m, 2H), 7.64 (d, 1H), 8.18 (m, 2H), and 11.2 (br, 1H).

**Example 68**2-Cyclopentylsulfanyl-2-(4-nitrophenyl)-N-pyridin-2-yl-acetamide

15

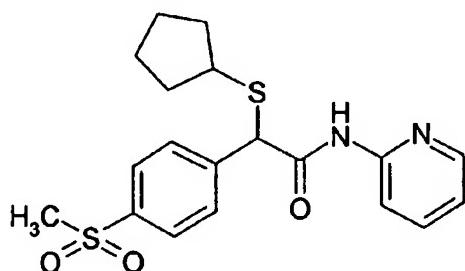
A solution of 2-cyclopentylthio-2-(4-nitrophenyl)acetic acid (70 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-nitrophenyl)-N-pyridin-2-yl-acetamide (63 mg, 70%).

LCMS (*m/z*): 358 (M+ H)<sup>+</sup>.

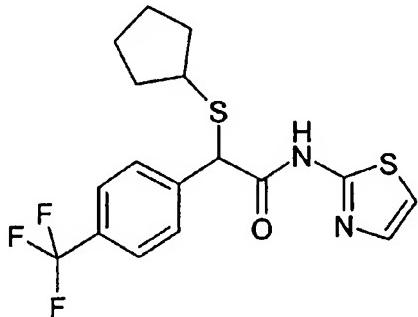
**Example 69**2-Cyclopentylsulfanyl-2-(4-methylsulfonyl)phenyl-N-1, 3-thiazol-2-yl-acetamide

2-Cyclopentylthio-2-(4-methylsulfonylphenyl)acetic acid (471 mg, 75%) is prepared

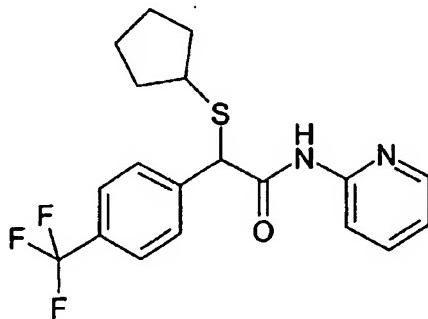
- 5 from 2-bromo-2-(4-methylsulfonylphenyl)acetic acid methyl ester (614 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (79 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-methylsulfonylphenyl)-N-1,3-thiazol-2-yl-acetamide (84 mg, 85%).
- 10 LCMS (*m/z*): 397 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.59 (m, 4H), 1.75 (m, 2H), 2.04 (m, 2H), 3.04 (s, 3H), 3.13 (m, 1H), 4.83 (s, 1H), 7.04 (d, 1H), 7.49 (d, 1H), 7.62 (m, 2H), 7.93 (m, 2H), 10.31 (br, 1H).

**Example 70**2-Cyclopentylsulfanyl-2-(4-methylsulfonylphenyl)-N-pyridin-2-yl-acetamide

- 15 A solution of 2-cyclopentylthio-2-(4-methylsulfonylphenyl)acetic acid (79 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-methylsulfonylphenyl)-N-pyridin-2-yl-acetamide (80 mg, 82%).
- 20 LCMS (*m/z*): 391 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.58 (m, 4H), 1.75 (m, 2H), 2.03 (m, 2H), 3.03 (s, 3H), 3.14 (m, 1H), 4.76 (s, 1H), 7.08 (m, 1H), 7.66 (m, 2H), 7.70 (m, 1H), 7.91 (m, 2H), 8.17 (d, 1H), 8.32 (m, 1H), 9.32 (br, 1H).

**Example 71**2-Cyclopentylsulfanyl-2-(4-trifluoromethyl)phenyl-N-1,3-thiazol-2-yl-acetamide

- 2-Cyclopentylthio-2-(4-trifluoromethylphenyl)acetic acid (413 mg, 68%) is prepared  
 5 from 2-bromo-2-(4-trifluoromethylphenyl)acetic acid methyl ester (594 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-trifluoromethylphenyl)-N-1,3-thiazol-2-yl-acetamide (82 mg, 85%).  
 10 LCMS (*m/z*): 387 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.62 (m, 4H), 1.71-1.80 (m, 2H), 1.96-2.08 (m, 2H), 3.06-3.16 (m, 1H), 4.82 (s, 1H), 7.03-7.048 (d, 1H), 7.48-7.49 (d, 1H), 7.53-7.55 (d, 2H), 7.6-7.62 (d, 2H), 10.51 (br, 1H).

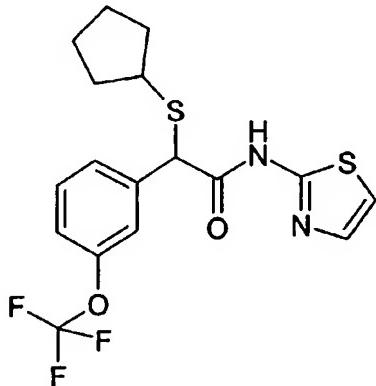
**Example 72**2-Cyclopentylsulfanyl-2-(4-trifluoromethyl)phenyl-N-pyridin-2-yl-acetamide

- A solution of 2-cyclopentylthio-2-(4-trifluoromethylphenyl)acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-trifluoromethylphenyl)-N-pyridin-2-yl-acetamide (76 mg, 80%).  
 20 LCMS (*m/z*): 381 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.57-1.65 (m, 4H), 1.70-1.81 (m, 2H), 1.93-2.05 (m, 2H), 3.11-3.17 (m, 1H), 4.75 (s, 1H), 7.06-7.10 (m, 1H), 7.24-7.25 (m, 1H), 7.56-7.61 (m, 3H), 7.69-7.74 (m, 1H), 8.19 (d, 1H), 8.29-8.31 (m, 1H), 9.34 (br, 1H).

### Example 73

5 2-Cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide



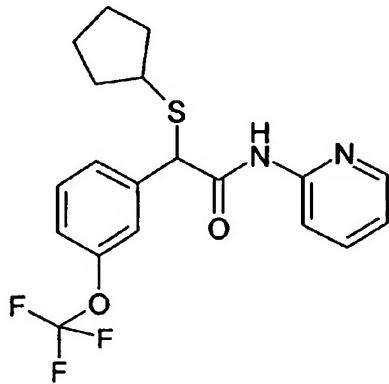
2-Cyclopentylthio-2-(3-trifluoromethoxyphenyl)acetic acid (416 mg, 65%) is prepared from 2-bromo-2-(3-trifluoromethoxyphenyl)acetic acid methyl ester (626 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (80 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide (78 mg, 78%).

LCMS (*m/z*): 403 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.61 (m, 4H), 1.75 (m, 2H), 2.02 (m, 2H), 3.13 (m, 1H), 4.77 (s, 1H), 7.03 (d, 1H), 7.18 (m, 1H), 7.27 (d, 1H), 7.33-7.40 (m, 2H), 7.47 (d, 1H), 10.25 (br, 1H).

### Example 74

2-Cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide



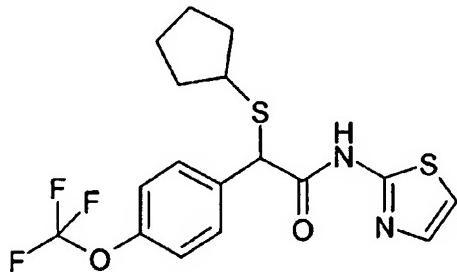
A solution of 2-cyclopentylthio-2-(3-trifluoromethoxyphenyl)acetic acid (80 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide (TTP-00176052) (71 mg, 72%).

5 LCMS (*m/z*): 397 ( $M + H$ )<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  1.58 (m, 4H), 1.73 (m, 2H), 2.03 (m, 2H), 3.14 (m, 1H), 4.70 (s, 1H), 7.05-7.10 (m, 1H), 7.15 (m, 1H), 7.31 (d, 1H), 7.36 (m, 2H), 7.71 (m, 1H), 8.19 (d, 1H), 8.31 (m, 1H), and 9.25 (br, 1H).

### Example 75

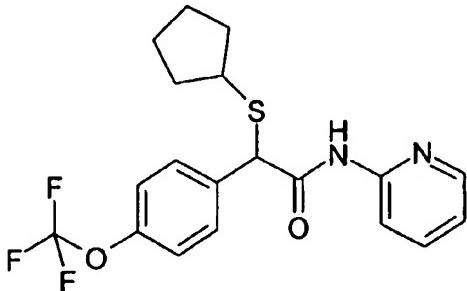
10 2-Cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide



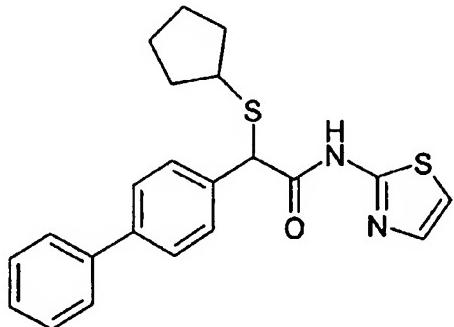
2-Cyclopentylthio-2-(4-trifluoromethoxyphenyl)acetic acid (448 mg, 70%) is prepared from 2-bromo-2-(4-trifluoromethoxyphenyl)acetic acid methyl ester (626 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (80 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide (85 mg, 85%).

LCMS (*m/z*): 403 ( $M + H$ )<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  1.55 (m, 4H), 1.74 (m, 2H), 2.01 (m, 2H), 3.11 (m, 1H), 4.79 (s, 1H), 7.03 (d, 1H), 7.26 (m, 2H), 7.47 (m, 3H), 10.87 (br, 1H).

**Example 76**2-Cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide

- A solution of 2-cyclopentylthio-2-(4-trifluoromethoxyphenyl)acetic acid (80 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide (79 mg, 80%).
- LCMS (*m/z*): 397 (M + H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.58 (m, 4H), 1.74 (m, 2H), 2.04 (m, 2H), 3.15 (m, 1H), 4.70 (s, 1H), 7.08 (m, 1H), 7.18 (dd, 2H), 7.47 (dd, 2H), 7.71 (m, 1H), 8.19 (d, 1H), 8.31 (m, 1H), 9.25 (br, 1H).

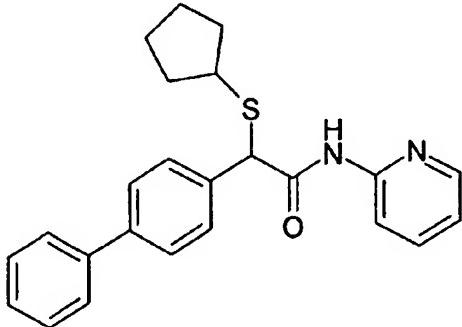
**Example 77**2-Cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-1,3-thiazol-2-yl-acetamide

- 2-Cyclopentylthio-2-(4-phenyl)phenylacetic acid (406 mg, 65%) is prepared from 2-bromo-biphenylacetic acid methyl ester (610 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (78 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-1,3-thiazol-2-yl-acetamide (69 mg, 70%).
- LCMS (*m/z*): 395 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.47-1.66 (m, 4H), 1.72-1.81 (m, 2H), 1.99-2.21 (m, 2H), 3.10-3.22 (p, 1H), 4.83 (s, 1H), 6.99-7.01 (m, 1H), 7.41-7.58 (m, 6H), 7.63-7.65 (m, 1H), 7.67-7.77 (m, 1H), 8.03 (d, 1H), 8.56 (d, 1H), 10.42 (br, 1H).

#### Example 78

5 2-Cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-pyridin-2-yl-acetamide



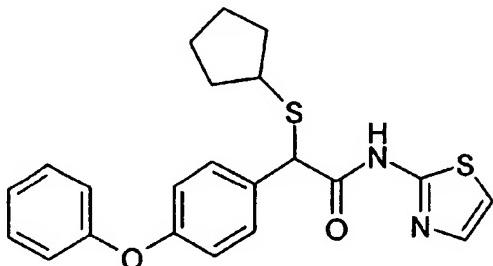
A solution of 2-cyclopentylthio-2-(4-phenyl)phenylacetic acid (78 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-pyridin-2-yl-acetamide (76 mg, 78%).

10 LCMS (*m/z*): 389 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.53-1.62 (m, 4H), 1.71-1.78 (m, 2H), 2.01-2.12 (m, 2H), 3.08-3.20 (p, 1H), 4.92 (s, 1H), 7.13-7.17 (m, 1H), 7.25-7.58 (m, 6H), 7.61-7.67 (m, 1H), 7.71-7.75 (m, 1H), 7.82-7.86 (m, 1H), 8.29-8.31 (m, 1H), 8.33-8.36 (m, 1H), 8.46-8.48 (d, 1H), 10.39 (br, 1H).

15 Example 79

2-Cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-1,3-thiazol-2-yl-acetamide



2-Cyclopentylthio-2-(4-phenoxyphenyl)acetic acid (459 mg, 70%) is prepared from 2-bromo-(4-phenoxyphenyl)acetic acid methyl ester (642 mg, 2 mmol) and cyclopentane thiol

20 (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (82 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general

procedure E to obtain 2-cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-1,3-thiazol-2-yl-acetamide (81 mg, 79%).

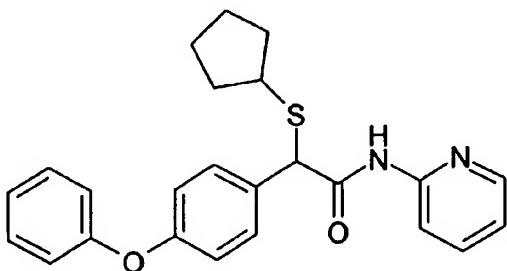
LCMS (*m/z*): 411 (M+ H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.60 (m, 4H), 1.75 (m, 2H), 2.05 (m, 2H), 3.15 (m, 1H), 4.72 (s,

5 1H), 6.95-7.12 (m, 5H), 7.34 (t, 1H), 7.41 (d, 2H), 7.73 (t, 1H), 8.24 (d, 1H), 8.30 (dd, 1H), and 9.39 (br, 1H).

#### Example 80

##### 2-Cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-pyridin-2-yl-acetamide



10 A solution of 2-cyclopentylthio-2-(4-phenoxyphenyl)acetic acid (82 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-pyridin-2-yl-acetamide (79 mg, 78%).

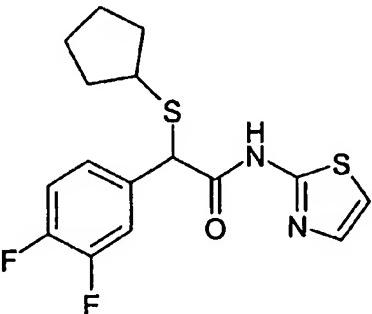
LCMS (*m/z*): 405 (M+ H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.53-1.56 (m, 4H), 1.72 (m, 2H), 1.98 (m, 2H), 3.16 (m, 1H),

15 4.81 (s, 1H), 6.99 (m, 4H), 7.14 (m, 2H), 7.29-7.44 (m, 4H), 7.49 (t, 1H), 7.56 (d, 1H), 8.00 (dd, 1H), and 10.93 (br, 1H).

#### Example 81

##### 2-Cyclopentylsulfanyl-2-(3,4-difluorophenyl)-N-1,3-thiazol-2-yl-acetamide



20 2-Cyclopentylthio-2-(3,4-difluorophenyl)acetic acid (316 mg, 58%) is prepared from 2-bromo-2-(3,4-difluorophenyl)acetic acid methyl ester (530 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (68 mg,

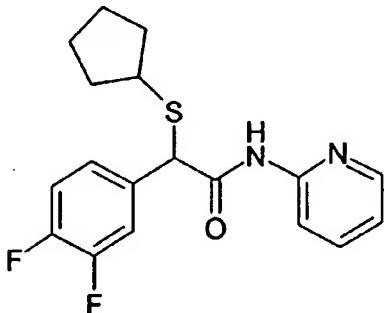
0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,4-difluorophenyl)-N-1,3-thiazol-2-yl-acetamide (66 mg, 75%).

LCMS (*m/z*): 355 (M + H)<sup>+</sup>

- 5   <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.55 (m, 4H), 1.70-1.74 (m, 2H), 1.87-2.02 (m, 2H), 3.03-3.09 (m, 1H), 4.74 (d, 1H), 7.06-7.18 (m, 1H), 7.28-7.34 (m, 1H), 7.70-7.74 (m, 1H), 8.19 (d, 1H), 8.29-8.31 (m, 1H), 9.28 (br, 1H).

### Example 82

#### 2-Cyclopentylsulfanyl-2-(3, 4-difluorophenyl)-N-pyridin-2-yl-acetamide



10

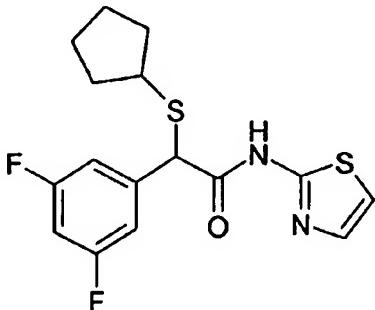
A solution of 2-cyclopentylthio-2-(3,4-difluorophenyl)acetic acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,4-difluorophenyl)-N-pyridin-2-yl-acetamide (61 mg, 70%).

LCMS (*m/z*): 349 (M + H)<sup>+</sup>

- 15   <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.50-1.62 (m, 4H), 1.69-1.80 (m, 2H), 1.87-2.08 (m, 2H), 3.09-3.16 (m, 1H), 4.69 (s, 1H), 7.01-7.08 (m, 3H), 7.42-7.44 (m, 1H), 7.72-7.74 (m, 1H), 8.19 (d, 1H), 8.30-8.32 (m, 1H), 9.88 (br, 1H).

### Example 83

#### 2-Cyclopentylsulfanyl-2-(3,5-difluorophenyl)-N-1, 3-thiazol-2-yl-acetamide



20

2-Cyclopentylthio-2-(3,5-difluorophenyl)acetic acid (326 mg, 60%) is prepared from 2-bromo-2-(3,5-difluorophenyl)acetic acid methyl ester (530 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,5-difluorophenyl)-N-1,3-thiazol-2-yl-acetamide (62 mg, 70%).

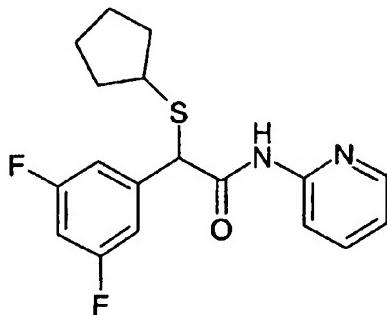
LCMS (*m/z*): 355 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.55 (m, 4H), 1.71-1.75 (m, 2H), 1.87-2.05 (m, 2H), 3.04-3.09 (m, 1H), 4.75 (d, 1H), 7.08-7.16 (m, 1H), 7.26-7.32 (m, 1H), 7.71-7.74 (m, 1H), 8.19 (d, 1H), 8.29-8.32 (m, 1H), 9.66 (br, 1H).

10

#### Example 84

##### 2-Cyclopentylsulfanyl-2-(3,5-difluorophenyl)-N-pyridin-2-yl-acetamide



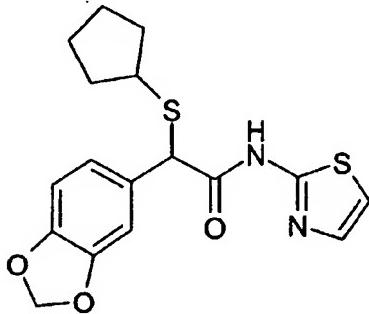
A solution of 2-cyclopentylthio-2-(3,5-difluorophenyl)acetic acid (68 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,5-difluorophenyl)-N-pyridin-2-yl-acetamide (66 mg, 76%).

15

LCMS (*m/z*): 349 (M + H)<sup>+</sup>.

#### Example 85

##### 2-Cyclopentylsulfanyl-2-(3,4-(methylenedioxy)phenyl)-N-1,3-thiazol-2-yl-acetamide



2-Cyclopentylthio-2-{3,4-(methylenedioxy)phenyl}acetic acid (336 mg, 60%) is prepared from 3,4-(methylenedioxy)mandelic acid methyl ester (420 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure D. A solution of this acid (70 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-{3,4-(methylenedioxy)phenyl}-N-1,3-thiazol-2-yl-acetamide (59 mg, 65%).

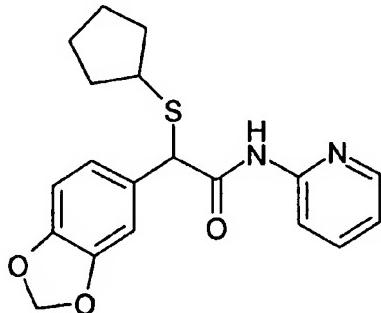
LCMS (*m/z*): 363 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.46-1.61 (m, 4H), 1.68-1.79 (m, 2H), 1.92-2.34 (m, 2H), 3.05-3.12 (m, 1H), 4.71 (s, 3H), 5.94-5.95 (m, 2H), 6.74 (d, 1H), 6.84 (d, 1H), 6.94 (s, 1H), 7.02 (d, 1H), 7.49 (d, 1H), 10.61 (br, 1H).

10

### Example 86

#### 2-Cyclopentylsulfanyl-2-{3,4-(methylenedioxy)phenyl}-N-pyridin-2-yl-acetamide



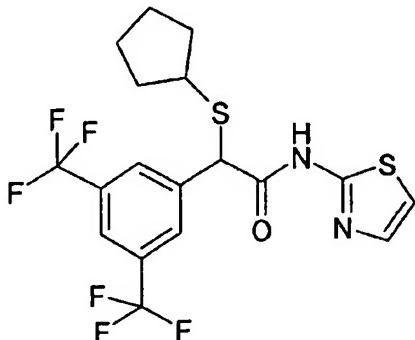
A solution of 2-cyclopentylthio-2-{3,4-(methylenedioxy)phenyl}acetic acid (70 mg,

15 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-{3,4-(methylenedioxy)phenyl}-N-pyridin-2-yl-acetamide (53 mg, 60%).

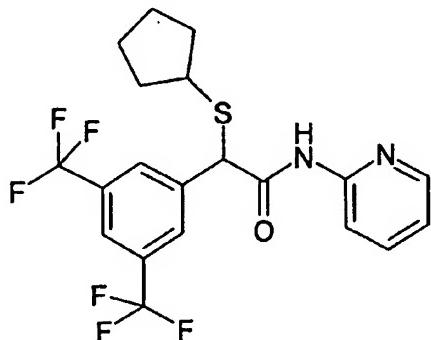
LCMS (*m/z*): 357 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.48-1.62 (m, 4H), 1.67-1.78 (m, 2H), 1.92-2.08 (m, 2H), 3.06-

20 3.14 (m, 1H), 4.62 (s, 3H), 5.93 (d, 2H), 6.74 (d, 1H), 6.87 (d, 1H), 6.95 (s, 1H), 7.02-7.06 (m, 1H), 7.67-7.71 (t, 1H), 8.19 (d, 1H), 8.28 (d, 1H), 9.17 (s, 1H).

**Example 87**2-Cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-1, 3-thiazol-2-yl-acetamide

- 2-Cyclopentylthio-2-[3,5-bis(trifluoromethyl)phenyl]acetic acid (521 mg, 70%) is prepared from 2-bromo-2-[3,5-bis(trifluoromethyl)phenyl]acetic acid methyl ester (730 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (93 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-1,3-thiazol-2-yl-acetamide (93 mg, 82%).
- LCMS (*m/z*): 455 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.51-1.64 (m, 4H), 1.69-1.78 (m, 2H), 1.92-2.00 (m, 2H), 3.14-3.22 (p, 1H), 4.91 (s, 1H), 7.48 (t, 1H), 7.61 (t, 1H), 7.72 (d, 1H), 7.80 (br, 1H), 8.810 (s, 1H), 11.12 (br, 1H).

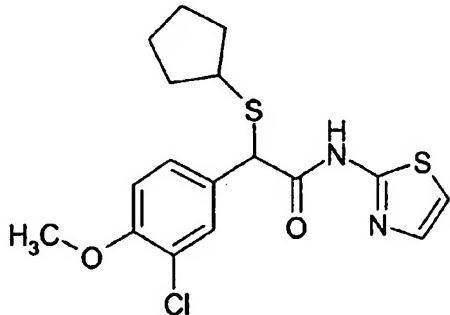
**Example 88**2-Cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-pyridin-2-yl-acetamide

- A solution of 2-cyclopentylthio-2-[3,5-bis(trifluoromethyl)phenyl]acetic acid (93 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-pyridin-2-yl-acetamide (90 mg, 80%).
- LCMS (*m/z*): 449 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.52-1.60 (m, 4H), 1.64-1.78 (m, 2H), 1.92-1.99 (m, 2H), 3.26-3.32 (m, 1H), 4.92 (s, 1H), 7.48 (t, 1H), 7.61 (t, 1H), 7.69 (s, 1H), 7.75 (d, 1H), 8.10 (s, 1H), 8.12 (d, 1H), 8.21-8.33 (dd, 1H), 11.12 (br, 1H).

### Example 89

5 2-Cyclopentylsulfanyl-2-(3-chloro-4-methoxy)phenyl-N-1,3-thiazol-2-yl-acetamide



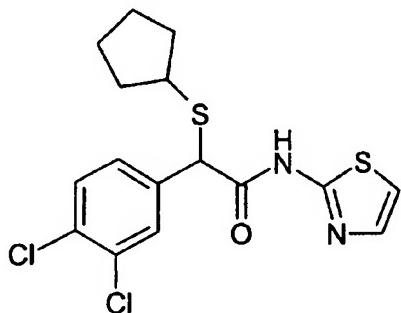
10 2-Cyclopentylthio-2-(3-chloro-4-methoxyphenyl)acetic acid (421 mg, 70%) is prepared from 2-bromo-2-(3-chloro-4-methoxyphenyl)acetic acid methyl ester (588 mg, 2 mmol) and cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (75 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3-chloro-4-methoxyphenyl)-N-1,3-thiazol-2-yl-acetamide (77 mg, 80%)

LCMS (*m/z*): 383 (M + H)<sup>+</sup>

15 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.60 (m, 4H), 1.75 (m, 2H), 2.03 (m, 2H), 3.12 (m, 1H), 3.90 (s, 3H), 4.70 (s, 1H), 6.89 (m, 1H), 7.00 (dd, 1H), 7.29 (m, 1H), 7.31 (dd, 1H), 7.45 (dd, 1H), 9.96 (br, 1H).

### Example 90

2-Cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-thiazol-2-yl-acetamide



20 2-(Cyclopentylthio)-2-(3,4-dichloro phenyl) acetic acid (458 mg, 75%) is prepared from 2-bromo-2-(3,4-dichloro phenyl) acetic acid methyl ester (594 mg, 2 mmol) and

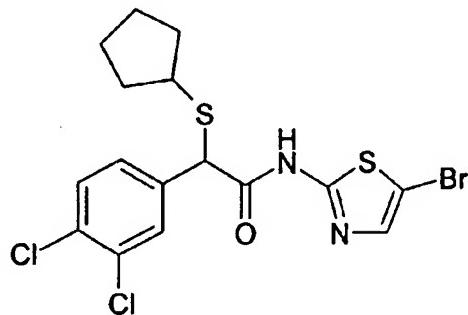
cyclopentane thiol (245 mg, 2.4 mmol) following the general procedure C. A solution of this acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-thiazol-2-yl-acetamide (87 mg, 90%).

5 LCMS (*m/z*): 387 ( $M + H$ )<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  1.48-1.62 (m, 4H), 1.71-1.80 (m, 2H), 1.96-2.05 (m, 2H), 3.08-3.15 (m, 1H), 4.71 (s, 1H), 7.03-7.04 (dd, 1H), 7.24-7.26 (m, 1H), 7.41 (d, 1H), 7.47 (d, 1H), 7.51 (d, 1H) 10.25 (br, 1H).

#### Example 91

10 N-(5-Bromo-1,3-thiazol-2-yl)-2-(cyclopentylthio)-2-(3,4-dichlorophenyl)acetamide

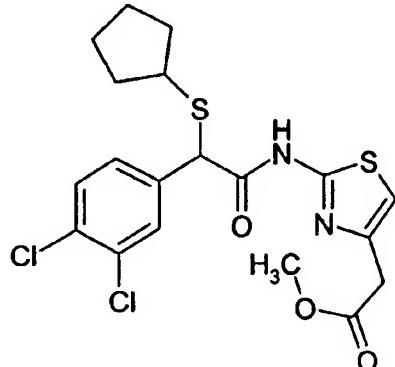


A solution of 2-(Cyclopentylthio)-2-(3,4-dichloro phenyl) acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-amino-5-bromo-thiazole (107 mg, 0.6 mmol) following the general procedure E to obtain N-(5-bromo-1,3-thiazol-2-yl)-2-(cyclopentylthio)-2-(3,4-dichlorophenyl)acetamide (93 mg, 80%).

15 LCMS 467 (*m/z*): ( $M + 2H$ )<sup>+</sup>

#### Example 92

2-Cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[4-methoxycarbonylmethyl]-1,3-thiazol-2-yl-acetamide



A solution of 2-cyclopentylthio-2-(3,4-dichlorophenyl)acetic acid (76 mg, 0.25 mmol) in THF is reacted with methyl-2-amino-4-thiazoleacetate (103 mg, 0.6 mmol) following the general procedure E to obtain 2-Cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methoxycarbonylmethyl)-1, 3-thiazol-2-yl]-acetamide (86 mg, 75%).

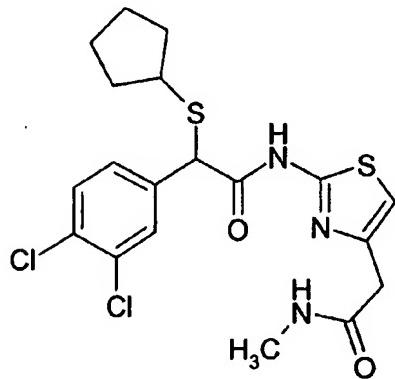
5 LCMS (*m/z*): 459 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.56 (m, 4H), 1.75 (m, 2H), 2.03 (m, 2H), 3.11 (m, 1H), 3.72 (d, 5H), 4.70 (s, 1H), 6.84 (s, 1H), 7.24 (dd, 1H), 7.42 (d, 1H), 7.51 (d, 1H), 10.16 (br, 1H).

### Example 93

#### 2-Cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methylaminocarbonylmethyl)-1, 3-thiazol-

10 2-yl]-acetamide



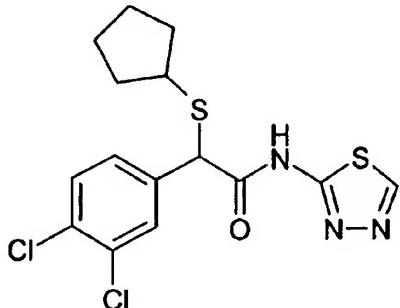
2-Cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methylaminocarbonylmethyl)-1, 3-thiazol-2-yl]-acetamide (114 mg, 0.25 mmol) is heated with 2N solution of methylamine in THF (5 ml) for 6h. The mixture is concentrated and the residue is purified by column

15 chromatography (hexanes-ethyl acetate, 1:1) to afford 2-cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methylaminocarbonylmethyl)-1, 3-thiazol-2-yl]-acetamide (108, 95%).

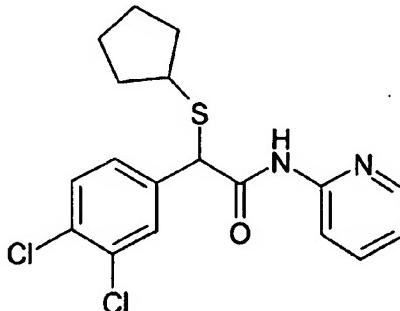
LCMS (*m/z*): 459 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.58 (m, 4H), 1.76 (m, 2H), 2.03 (m, 2H), 2.81 (d, 3H), 3.12 (m, 1H), 3.63 (s, 2H), 4.74 (s, 1H), 6.79 (s, 1H), 7.27 (dd, 1H), 7.43 (d, 1H), 7.53 (d, 1H), 10.10

20 (br, 1H).

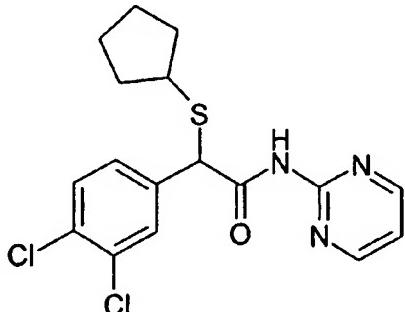
**Example 94**2-(Cyclopentylthio)-2-(3,4-dichlorophenyl)-N-1,3,4-thiadiazol-2-ylacetamide

A solution of 2-(cyclopentylthio)-2-(3,4-dichlorophenyl) acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-amino thiadiazole (120 mg, 1.2 mmol) following the general procedure E to obtain 2-(cyclopentylthio)-2-(3,4-dichlorophenyl)-N-1,3,4-thiadiazol-2-ylacetamide (79 mg, 82%).  
 LCMS (*m/z*): 389 (M + 2H)<sup>+</sup>

**Example 95**2-Cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyridinyl-2-yl-acetamide

A solution of 2-(cyclopentylthio)-2-(3,4-dichlorophenyl) acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyridinyl-2-yl-acetamide (84 mg, 88%).  
 LCMS (*m/z*): 381 (M + H)<sup>+</sup>

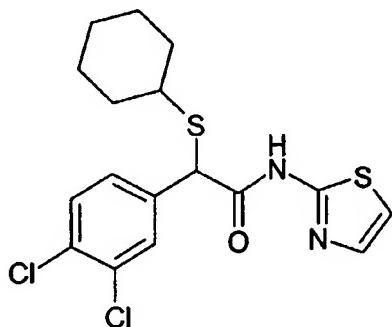
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.52-1.61 (m, 4H), 1.67-1.81 (m, 2H), 1.89-2.10 (m, 2H), 3.08-3.17 (m, 1H), 4.72 (s, 1H), 7.03-7.08 (m, 3H), 7.41-7.42 (m, 1H), 7.73-7.75 (m, 1H), 8.19 (d, 1H), 8.31-8.32 (m, 1H), 9.66 (br, 1H).

**Example 96**2-Cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyrimidin-2-yl-acetamide

A solution of 2-(cyclopentylthio)-2-(3,4-dichloro phenyl) acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminopyrimidine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyrimidin-2-yl-acetamide (81 mg, 85%).

LCMS (*m/z*): 382 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.53-1.57 (m, 4 H), 1.70-1.75 (m, 2H), 1.99-2.04 (m, 2 H), 3.11-3.18 (m, 1H), 4.72 (s, 1H), 7.07-7.09 (t, 1H), 7.39, (s, 1H), 7.48 (t, 1H), 7.64 (s, 1H), 8.11-8.13 (dd, 1H), 8.65 (d, 1H), 9.82 (br, 1H).

**Example 97**2-Cyclohexylsulfanyl-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-yl-acetamide

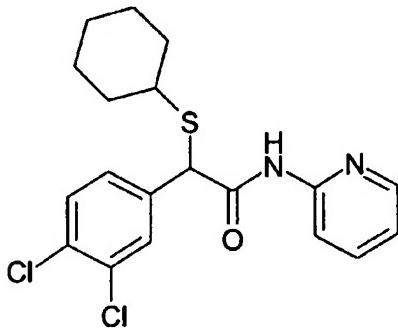
2-Cyclohexylthio-2-(3,4-dichlorophenyl)acetic acid (458 mg, 75%) is prepared from 2-bromo-2-(3,4-dichlorophenyl)acetic acid methyl ester (594 mg, 2 mmol) and cyclohexane thiol (278 mg, 2.4 mmol) following the general procedure C. A solution of this acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclohexylsulfanyl-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-yl-acetamide (72 mg, 72 %).

LCMS (*m/z*): 401 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.84-0.87 (m, 1H), 1.09-1.41 (m, 4H), 1.48-2.02 (m, 4H), 2.65-2.78 (m, 1H), 4.87 (s, 1H), 6.98-7.04 (dd, 1H), 7.33-7.35 (dd, 1H), 7.41-7.48 (m, 2H), 7.62-7.67 (dd, 1H), 11.64 (br, 1H).

**Example 98**

5 2-Cyclohexylsulfanyl-2-(3, 4-dichlorophenyl)-N-pyridin-2-yl-acetamide



A solution of 2-cyclohexylthio-2-(3,4-dichlorophenyl)acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-cyclohexylsulfanyl-2-(3,4-dichlorophenyl)-N-pyridin-2-yl-acetamide (TTP-

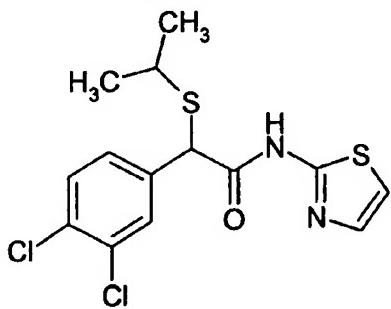
10 00176116 (69 mg, 70%).

LCMS (*m/z*): 395 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.81-0.89 (m, 1H), 1.24-1.47 (m, 4H), 1.60-2.11 (m, 4H), 2.74-2.81 (m, 1H), 4.66 (s, 1H), 7.06-7.10 (m, 1H), 7.26-7.33 (m, 1H), 7.37-7.41 (dd, 2H), 7.53 (d, 1H), 7.69-7.74 (m, 1H), 8.17 (d, 1H), 8.31-8.32 (dd, 1H), 9.34 (br, 1H).

15 **Example 99**

2-Isopropylsulfanyl-2-(3,4-dichlorophenyl)-N-1, 3-thiazol-2-yl-acetamide



2-Isopropylthio-2-(3,4-dichlorophenyl)acetic acid (458 mg, 75%) is prepared from 2-bromo-2-(3,4-dichlorophenyl)acetic acid methyl ester (594 mg, 2 mmol) and isopropane thiol

20 (183 mg, 2.4 mmol) following the general procedure C. A solution of this acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general

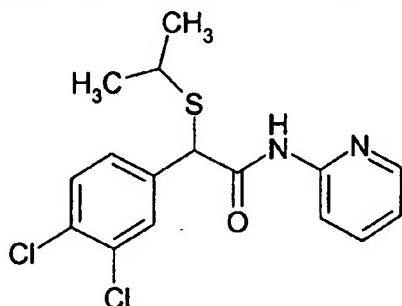
procedure E to obtain 2-isopropylsulfanyl-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-yl-acetamide (TTP-00176084 (67 mg, 74%).

LCMS (*m/z*): 361 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.24-1.27 (dd, 6H), 2.91-3.10 (m, 1H), 4.77 (s, 1H), 7.01-7.03 (m, 1H), 7.25-7.29 (m, 1H), 7.37-7.41 (m, 1H), 7.51-7.55 (m, 1H), 7.97-7.99 (dd, 1H), 11.24 (br, 1H).

### Example 100

#### 2-isopropylsulfanyl-2-(3,4-dichlorophenyl)-N-pyridin-2-yl-acetamide



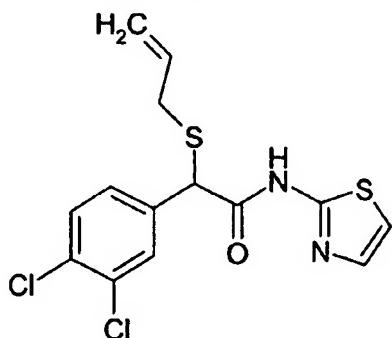
10 A solution of 2-isopropylthio-2-(3,4-dichlorophenyl)acetic acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-isopropylsulfanyl-2-(3,4-dichlorophenyl)-N-pyridin-2-yl-acetamide (64 mg, 72%).

LCMS (*m/z*): 355 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.30-1.33 (dd, 6H), 2.97-3.05 (m, 1H), 4.66 (s, 1H), 7.06-7.09 (m, 1H), 7.26-7.29 (m, 1H), 7.40 (d, 1H), 7.53 (d, 1H), 7.68-7.73 (m, 1H), 8.17 (d, 1H), 8.29-8.31 (m, 1H), 9.31 (br, 1H).

### Example 101

#### 2-Allylsulfanyl-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-yl-acetamide



20 2-Allylthio-2-(3,4-dichlorophenyl)acetic acid (458 mg, 75%) is prepared from 2-bromo-2-(3,4-dichlorophenyl)acetic acid methyl ester (594 mg, 2 mmol) and allyl thiol (178

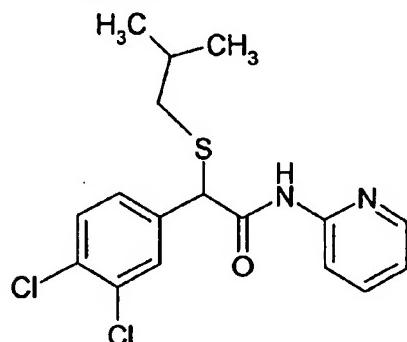
mg, 2.4 mmol) following the general procedure C. A solution of this acid (76 mg, 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-allylsulfanyl-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-yl-acetamide (72 mg, 80%).

LCMS (*m/z*): 359 (M + H)<sup>+</sup>

- 5   <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 3.09-3.25 (m, 2H), 2.91-3.10 (m, 1H), 4.66 (s, 1H), 5.05-5.16 (m, 2H), 5.73-5.82 (m, 1H), 7.05-7.07 (m, 1H), 7.24-7.27 (dd, 1H), 7.38-7.44 (dd, 1H), 7.52 (d, 1H), 7.94-7.97 (dd, 1H), 11.78 (br, 1H).

### Example 102

#### 2-(3,4-Dichlorophenyl)-2-(isobutylthio)-N-pyridin-2-ylacetamide

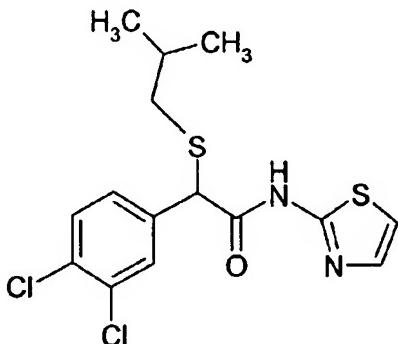


10

- 2-(2-Methylpropanethio)-2-(3,4-dichlorophenyl) acetic acid (457 mg, 78%) is prepared from 2-bromo-2-(3,4-dichlorophenyl) acetic acid methyl ester (594 mmol, 2 mmol) and 2-methylpropanethiol (216 mg, 2.4 mmol) following the general procedure C. A solution of this acid (73 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenyl)-2-(isobutylthio)-N-pyridin-2-ylacetamide (69 mg, 88%).

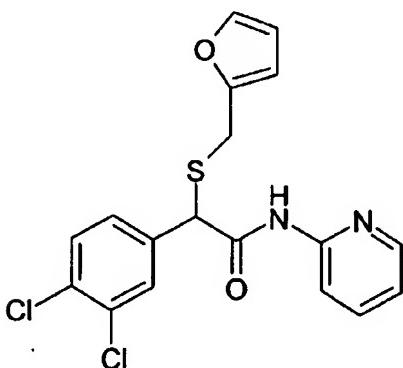
LCMS (*m/z*): 369 (M + H)<sup>+</sup>

- 15   <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.96-1.01 (dd, 7H), 1.82-1.89 (m, 1H), 2.49-2.51 (m, 2H), 5.3 (s, 1H), 7.08-7.09 (m, 1H), 7.26-7.29 (m, 1H), 7.41 (d, 1H), 7.54 (d, 1H), 7.69-7.73 (m, 1H), 20   8.17 (d, 1H), 8.30-8.32 (m, 1H), 9.19 (br, 1H).

**Example 103**2-(3,4-Dichlorophenyl)-2-(isobutylthio)-N-1,3-thiazol-2-ylacetamide

A solution of 2-(2-methylpropanethio)-2-(3,4-dichlorophenyl) acetic acid (73 mg  
 5 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenyl)-2-(isobutylthio)-N-1,3-thiazol-2-ylacetamide (72 mg, 90%).

LCMS (*m/z*): 375 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.94 (d, 6H), 1.76 (m, 1H), 2.44 (m, 2H), 4.67 (s, 1H), 7.06 (d,  
 10 1H), 7.30 (d, 1H), 7.41 (d, 1H), 7.48 (d, 1H), 7.55 (s, 1H), 11.54 (br, 1H).

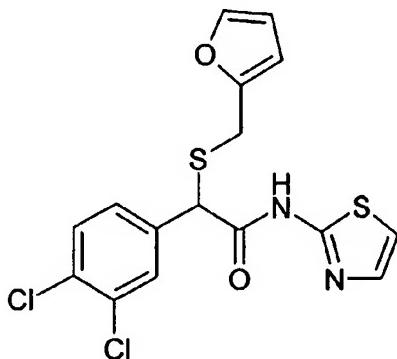
**Example 104**2-(3,4-Dichlorophenyl)-2-[(2-furylmethyl)thio]-N-pyridin-2-ylacetamide

2-(2-Furylmethylthio)-2-(3,4-dichlorophenyl) acetic acid (482 mg, 76%) is  
 15 prepared from 2-bromo-2-(3,4-dichlorophenyl) acetic acid methyl ester (594 mg, 2 mmol)  
 and 2-furylmethylthiol (274 mg, 2.4 mmol) following the general procedure C. A solution of  
 this acid (79 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol)  
 following the general procedure E to obtain 2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-  
 pyridin-2-ylacetamide (80 mg, 82%).  
 20 LCMS (*m/z*): 393 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 3.78 (dd, 2H), 4.56 (s, 1H), 6.24 (dd, 2H), 7.07 (t, 1H), 7.24 (d, 1H), 7.30 (d, 1H), 7.39 (d, 1H), 7.49 (s, 1H), 7.70 (dd, 1H), 8.15 (d, 1H), 8.26 (dd, 1H), 9.14 (br, 1H).

#### Example 105

5 2-(3,4-Dichlorophenyl)-2-[(2-furylmethyl)thio]-N-1,3-thiazol-2-ylacetamide



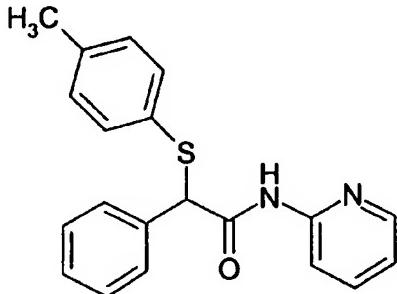
A solution of 2-(2-furylmethylthio)-2-(3,4-dichlorophenyl) acetic acid (79 mg 0.25 mmol) in THF is reacted with 2-aminothiazole (60 mg, 0.62 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-1,3-thiazol-2-ylacetamide (85 mg, 85%).

10 LCMS (*m/z*): 399 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 3.78 (dd, 2H), 4.67 (s, 1H), 6.14 (s, 1H), 6.23 (s, 1H), 7.02 (d, 1H), 7.24 (m, 2H), 7.37 (m, 2H), 7.49 (s, 1H), 11.41 (br, 1H).

#### Example 106

15 2-(4-Methylthio)-2-phenyl-N-pyridin-2-ylacetamide



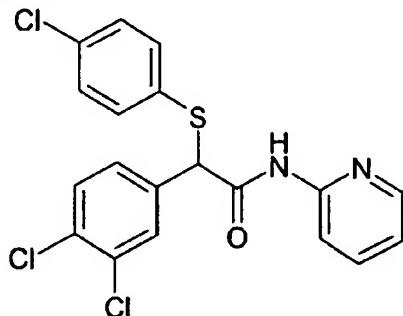
2-(4-Methylphenylthio)-2-phenylacetic acid (310 mg, 60%) is prepared from *o*-bromophenylacetic acid methyl ester (458 mg, 2 mmol) and 4-methylthiophenol (298 mg, 2.4 mmol) following the general procedure C. A solution of this acid (65 mg, 0.25 mmol) in THF

is reacted with 2-aminopyridine (57 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-methylphenylthio)-2-phenyl-N-pyridin-2-ylacetamide (61 mg, 72%).

LCMS (*m/z*): 335 (M + H)<sup>+</sup>.

### Example 107

5 2-(3,4-Dichlorophenyl)-2-[(2-furylmethyl)thio]-N-pyridin-2-ylacetamide



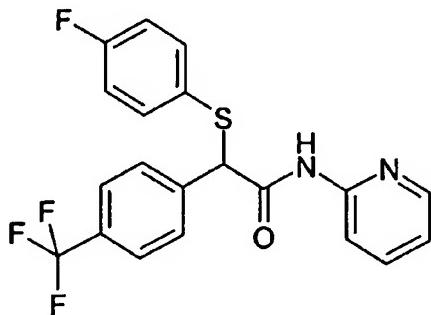
2-(4-Chlorophenylthio)-2-(3,4-dichlorophenyl)acetic acid (542 g, 78%) is prepared from 2-bromo-2-(3,4-dichlorophenyl)acetic acid methyl ester (594 mg, 2 mmol), 4-chlorobenzenethiol (347 mg, 2.4 mmol) following the general procedure C. A solution of this acid 10 (87 g, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-pyridin-2-ylacetamide (85 mg, 80%).

LCMS (*m/z*): 423 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 4.88 (s, 1H), 7.06-7.10 (m, 1H), 7.24-7.27 (m, 3H), 7.31-7.34 (m, 2H), 7.42 (d, 1H), 7.51 (d, 1H), 7.69-7.73 (m, 1H), 8.13 (d, 1H), 8.27-8.29 (dd, 1H), 8.98 (br, 1H).

### Example 108

2-[(4-Fluorophenyl)thio]-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide



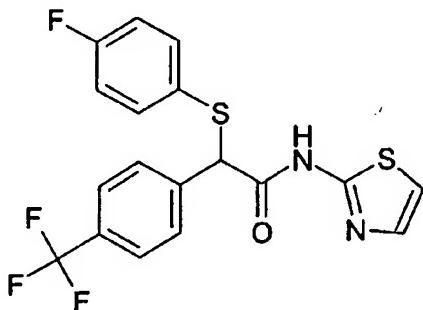
20 2-(4-Fluorophenylthio)-2-(4-trifluoromethylphenyl)acetic acid (760 mg, 92%) is prepared from 2-hydroxy-2-(4-trifluoromethyl phenyl)acetic acid methyl ester (860 mg, 2.5

mmol) and 4-fluorobenzenethiol (308 mg, 2.4 mmol) following the general procedure D. A solution of this acid (165 mg, 0.50 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-[(4-fluorophenyl)thio]-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide (0.12 g, 59%) as a solid.

5 LCMS (*m/z*): 408 (M+2H)<sup>+</sup>

#### Example 109

##### 2-[(4-Fluorophenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide

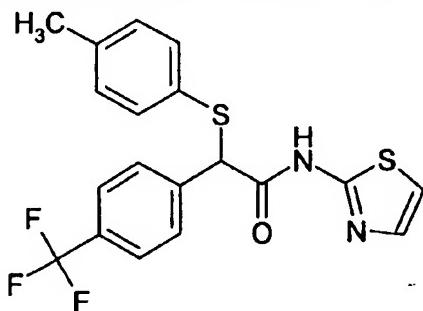


A solution of 2-(4-fluorophenylthio)-2-(4-trifluoromethyl phenyl) acetic acid (165 mg, 10 0.50 mmol) in THF is reacted with 2-aminothiazole (500 mg, 0.5 mmol) following the general procedure E to obtain 2-[(4-fluorophenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]-acetamide (93 mg, 45%) as a solid.

LCMS (*m/z*): 414 (M+2H)<sup>+</sup>

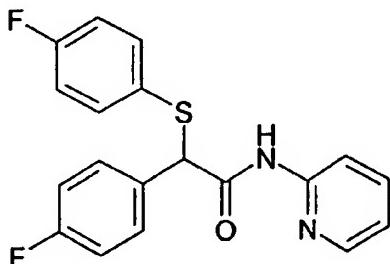
#### Example 110

##### 2-[(4-Methylphenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide

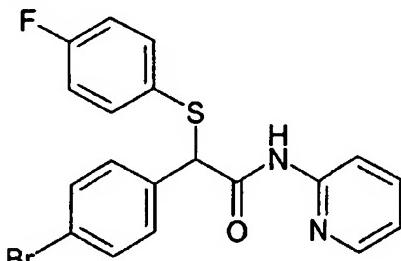


A solution of 2-(4-methylphenylthio)-2-(4-trifluoromethylphenyl)acetic acid (160 mg, 0.50 mmol) in THF is reacted with 2-aminothiazole (0.50 g, 0.50 mmol) following the general procedure E to obtain 2-[(4-methylphenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]-acetamide (94 mg, 45%).

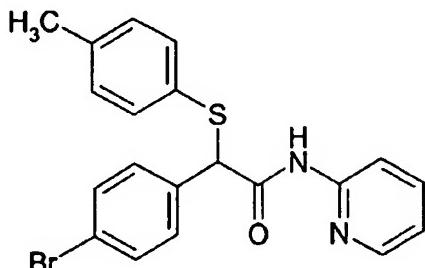
LCMS (*m/z*): 410 (M +2H)<sup>+</sup>

**Example 111**2-(4-Fluorophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide

- 2-(4-Fluorophenylthio)-2-(4-fluorophenyl)acetic acid (400 mg, 75%) is prepared from
- 5 2-hydroxy-2-(4-fluorophenyl)acetic acid methyl ester (368 mg, 2 mmol) and 4-fluorobenzene-thiol (307 mg, 2.4 mmol) following the general procedure D. A solution of this acid (66 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-fluorophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide (73 mg, 82%).
- 10 LCMS (*m/z*): 357 ( $M + H$ )<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 4.91 (s, 1H), 6.95-7.08 (m, 5H), 7.37-7.42 (m, 4H), 7.70 (m, 1H), 8.15 (d, 1H), 8.27 (d, 1H), 8.94 (br, 1H).

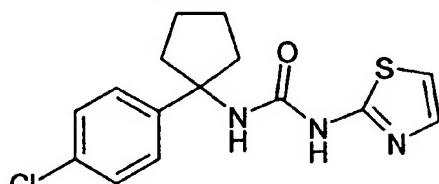
**Example 112**2-(4-Bromophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide

- 15 2-(4-Fluorophenylthio)-2-(4-bromophenyl) acetic acid (593 mg, 87%) is prepared from 2-hydroxy-2-(4-bromophenyl) acetic acid methyl ester (490 mg, 2 mmol) and 4-fluorobenzenethiol (307 mg, 2.4 mmol) following the general procedure D. A solution of this acid (85 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-bromophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide (88 mg, 85%).
- LCMS (*m/z*): 419 ( $M + 2 H$ )<sup>+</sup>

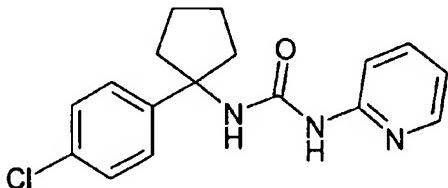
**Example 113**2-(4-Bromophenyl)-2-[(4-methylphenyl)thio]-N-pyridin-2-ylacetamide

2-(4-Methylphenylthio)-2-(4-bromophenyl)acetic acid (559 mg, 83%) is prepared

- 5 from 2-hydroxy-2-(4-bromophenyl) acetic acid methyl ester (490 mg, 2 mmol) and 4-methylbenzenethiol (298 mg, 2.4 mmol) following the general procedure D. A solution of this acid (84 mg, 0.25 mmol) in THF is reacted with 2-aminopyridine (56 mg, 0.6 mmol) following the general procedure E to obtain 2-(4-bromophenyl)-2-[(4-methylphenyl)thio]-N-pyridin-2-ylacetamide (85 mg, 82%).
- 10 LCMS (*m/z*): 414 ( $M + H$ )<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  2.29 (s, 3H), 4.90 (s, 1H), 7.05 (dd, 1H), 7.08 (d, 2H), 7.31 (d, 4H), 7.46 (d, 2H), 7.68 (t, 1H), 8.14 (d, 1H), 8.28 (d, 1H), 9.11 (br, 1H).

**Example 114**N-[1-(4-Chlorophenyl)cyclopentyl]-N'-1,3-thiazol-2-ylurea

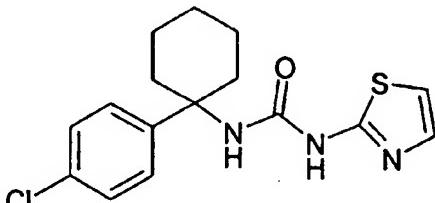
- 15 Following general procedure H, 1-(4-chlorophenyl)-1-cyclopentanecarboxylic acid (112 mg, 0.5 mmol) is transformed into the corresponding acid chloride, which in turn gave the 1-(4-chlorophenyl)-1-cyclopentyl isocyanate. This isocyanate is reacted with 2-aminothiazole (100 mg, 1.0 mmol) to obtain N-[1-(4-chlorophenyl)cyclopentyl]-N'-1,3-thiazol-2-ylurea (115 mg, 72%).
- 20 LCMS (*m/z*): 322 ( $M + H$ )<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  1.83 (m, 4H), 2.04 (m, 2H), 2.30 (m, 2H), 6.78 (d, 1H), 7.25-7.36 (m, 5H), 10.00 (br, 2H).

**Example 115**N-[1-(4-Chlorophenyl)cyclopentyl]-N'-pyridin-2-ylurea

Following general procedure H, 1-(4-chlorophenyl)-1-cyclopentanecarboxylic acid (112 mg, 0.5 mmol) is transformed into the corresponding acid chloride, which in turn gave the 1-(4-chlorophenyl)-1-cyclopentyl isocyanate. This isocyanate is reacted with 2-amino-pyridine (94 mg, 1.0 mmol) to obtain N-[1-(4-chlorophenyl)cyclopentyl]-N'-pyridin-2-ylurea (108 mg, 68%).

LCMS (*m/z*): 316 (M + H)<sup>+</sup>

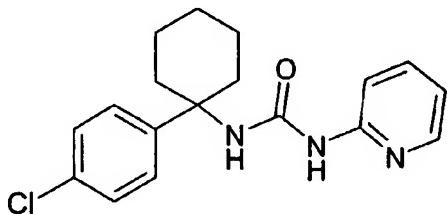
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.80-1.92 (m, 4H), 2.02-2.09 (m, 2H), 2.36-2.40 (m, 2H), 6.32 (d, 1H), 6.83 (dd, 1H), 7.25 (m, 2H), 7.41 (m, 2H), 7.49 (m, 1H), 8.12 (d, 1H), 8.87 (br, 1H), 9.94 (br, 1H).

**Example 116**N-[1-(4-Chlorophenyl)cyclohexyl]-N'-1,3-thiazol-2-ylurea

Following general procedure H, 1-(4-chlorophenyl)-1-cyclohexanecarboxylic acid (119 mg, 0.5 mmol) is transformed into the corresponding acid chloride, which in turn gave the 1-(4-chlorophenyl)-1-cyclohexyl isocyanate. This isocyanate is reacted with 2-amino-thiazole (100 mg, 1.0 mmol) to obtain N-[1-(4-chlorophenyl)cyclohexyl]-N'-1,3-thiazol-2-ylurea (104 mg, 62%).

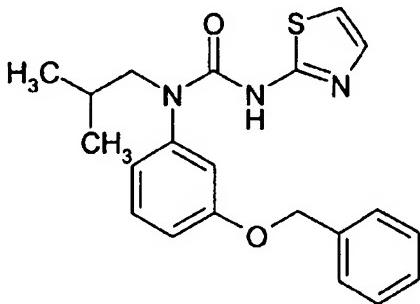
LCMS (*m/z*): 336 (M + H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.28 (m, 1H), 1.57-1.76 (m, 7H), 2.26 (d, 2H), 6.80 (d, 1H), 7.24-7.34 (m, 5H), 10.00 (br, 2H).

**Example 117**N-[1-(4-Chlorophenyl)cyclohexyl]-N'-pyridin-2-ylurea

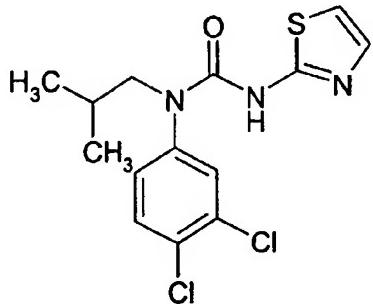
Following general procedure H, 1-(4-chlorophenyl)-1-cyclohexanecarboxylic acid

- 5 (119 mg, 0.5 mmol) is transformed into the corresponding acid chloride, which in turn gave the 1-(4-chlorophenyl)-1-cyclohexyl isocyanate. This isocyanate is reacted with 2-amino-pyridine (94 mg, 1.0 mmol) to obtain N-[1-(4-chlorophenyl)cyclohexyl]-N'-pyridin-2-ylurea (106 mg, 65%).  
 LCMS (*m/z*): 330 (M + H)<sup>+</sup>
- 10 <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.27 (m, 1H), 1.67-1.80 (m, 7H), 2.38 (m, 2H), 6.30 (br, 1H), 6.87 (m, 1H), 7.25-7.41 (m, 4H), 7.51 (d, 1H), 8.17 (s, 1H), 8.40 (br, 1H), 10.09 (br, 1H).

**Example 118**1-(3-Benzylxyphenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea

- 15 1-(3-Benzylxyphenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea (27 mg, 70.9%) is prepared from (3-benzylxyphenyl)-*i*-butyl amine (25 mg, 0.1 mmol) following the general procedure X to afford the title compound.

- LCMS (*m/z*): 382 (M + H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.00 (d, 6H), 2.21 (d, 2H), 2.36 (s, 2H), 3.02 (m, 1H), 6.84 (d, 1H), 7.09 (m, 2H), 7.16 (t, 1H), 7.24 (s, 1H), 7.25 (m, 4H), 7.57 (d, 1H), 7.96 (d, 1H), 8.23 (br, 1H).

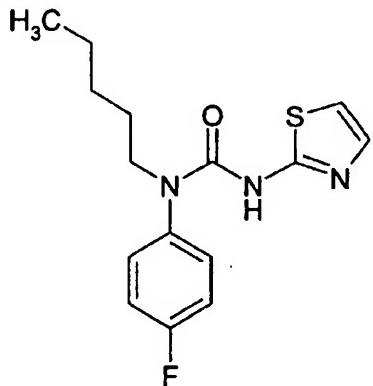
**Example 119**1-(3,4-Dichlorophenyl)-1-i-butyl-3-(thiazol-2-yl)urea

1-(3,4-Dichlorophenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea (24 mg, 70%) is prepared from

- 5 (3,4-dichlorophenyl)-*i*-butyl amine (20 mg, 0.1 mmol) following the general procedure X to afford the title compound.

LCMS (*m/z*): 344 (M+ H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.97 (d, 6H), 1.85 (m, 1H), 3.59 (d, 2H), 7.16 (s, 1H), 7.28 (d, 2H), 7.42 (dd, 1H), 7.56 (d, 1H), 8.80 (br, 1H).

**10 Example 120**1-(4-Fluorophenyl)-1-n-pentyl-3-(thiazol-2-yl)urea

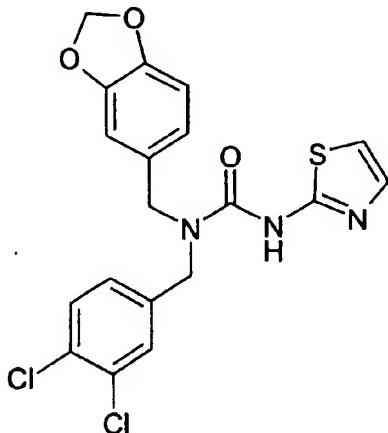
1-(4-Fluorophenyl)-1-*n*-pentyl-3-(thiazol-2-yl)urea (24 mg, 74.9%) is prepared from

(4-fluorophenyl) *n*-pentyl amine (18 mg, 0.1 mmol) following the general procedure X to

- 15 afford the title compound.

LCMS (*m/z*): 308 (M+ H)<sup>+</sup>

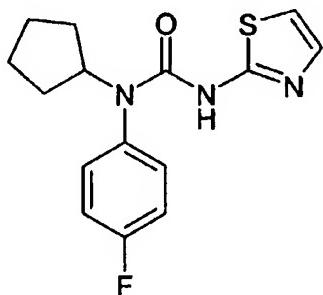
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.87 (t, 3H), 1.30 (m 4H), 1.58 (m, 2H), 3.71 (t, 2H), 6.87 (d, 1H), 7.24 (m, 4H), 7.29 (d, 1H), 7.60 (br, 1H).

**Example 121**1-(3,4-Methylenedioxybenzyl)-1-(3,4-dichlorobenzyl)-3-(thiazol-2-yl)urea

1-(3,4-Methylenedioxybenzyl)-1-(3,4-dichlorobenzyl)-3-(thiazol-2-yl)urea (29 mg, 66.5%) is prepared from N-(3,4-methylenedioxybenzyl)-N-(3,4-dichlorobenzyl) amine (30 mg, 0.1 mmol) following the general procedure X to afford the title compound.

LCMS (*m/z*): 436 (M+ H)<sup>+</sup>

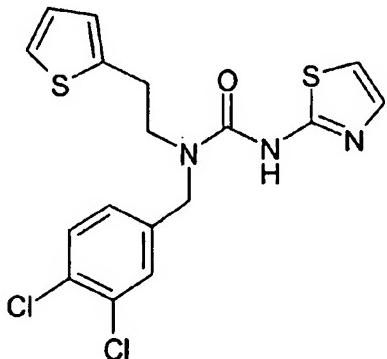
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 4.43 (s, 2H), 4.53 (s, 2H), 5.96 (s, 2H), 6.76 (d, 1H), 6.84 (s, 1H), 7.19 (s, 1H), 7.31 (d, 2H), 7.40 (d, 2H), 8.38 (d, 1H), 9.73 (br, 1H).

**10 Example 122**1-(4-Fluorophenyl)-1-cyclopentyl-3-(thiazol-2-yl)urea

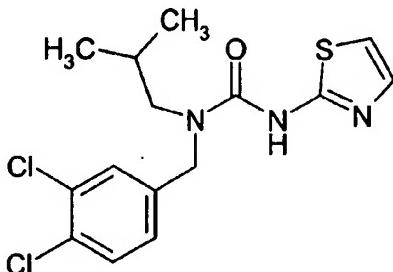
1-(4-Fluorophenyl)-1-cyclopentyl-3-(thiazol-2-yl)urea (19 mg, 62.2%) is prepared from 4-fluorophenyl cyclopentyl amine (18 mg, 0.1 mmol) following the general procedure X to afford the title compound.

LCMS (*m/z*): 306 (M+ H)<sup>+</sup>

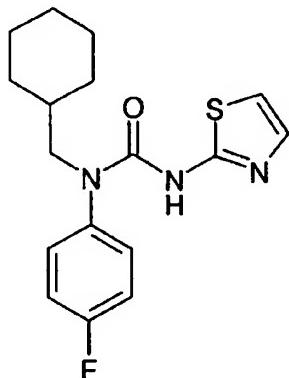
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.25 (m, 4H), 1.55 (m, 2H), 1.96 (m, 2H), 4.85 (p, 1H), 6.85 (d, 1H), 7.19 (m, 2H), 7.25 (m, 2H), 7.67 (br, 1H), 8.18 (d, 1H).

**Example 123**1-(3,4-Dichlorobenzyl)-1-[ethyl-(2-thiophene)]-3-(thiazol-2-yl)urea

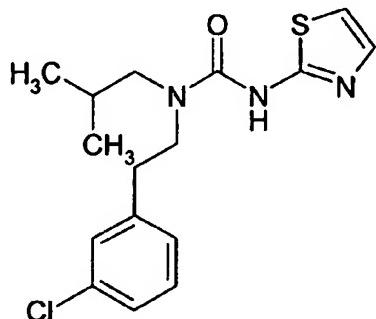
- 1-(3,4-Dichlorobenzyl)-1-[2-(2-thienyl)ethyl]-3-(thiazol-2-yl)urea (33 mg, 80.3%) is prepared from 3,4-dichlorobenzyl [2-(2-thienyl)ethyl] amine (28 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 412 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 3.10 (t, 2H), 3.62 (t, 2H), 4.45 (s, 2H), 6.84 (dd, 2H), 6.94 (m, 1H), 7.15 (t, 1H), 7.29 (d, 1H), 7.38 (s, 1H), 7.40 (m, 1H), 8.02 (d, 1H), 9.74 (br, 1H).

**10 Example 124**1-(3,4-Dichlorobenzyl)-1-*i*-butyl-3-(thiazol-2-yl)urea

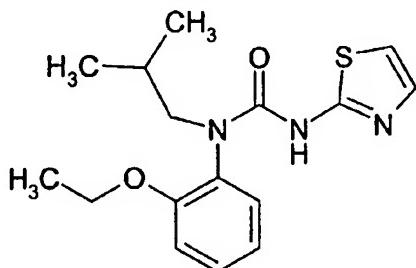
- 1-(3,4-Dichlorobenzyl)-1-*i*-butyl-3-(thiazol-2-yl)urea (26 mg, 72.2%) is prepared from 3,4-dichlorobenzyl *i*-butyl amine (23 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 358 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.92 (d, 6H), 2.03 (m, 1H), 3.11 (d, 2H), 4.59 (s, 2H), 6.88 (d, 1H), 7.08 (dd, 1H), 7.32 (m, 2H), 7.41 (d, 1H), 8.66 (br, 1H).

**Example 125**1-(4-Fluorophenyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea

- 1-(4-Fluorophenyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea (20 mg, 60%) is prepared
- 5 from cyclohexylmethyl 4-fluorophenyl amine (21 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 334 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.06 (m, 2H), 1.17 (m, 4H), 1.52 (m, 1H), 1.71 (m, 4H), 3.59 (d, 2H), 6.86 (d, 1H), 7.18 (d, 1H), 7.24-7.31 (m, 4H), 7.64 (br, 1H).

**10 Example 126**1-(3-Chlorophenethyl)-1-i-butyl-3-(thiazol-2-yl)urea

- 1-(3-Chlorophenethyl)-1-*i*-butyl-3-(thiazol-2-yl)urea (22 mg, 65.3%) is prepared from (3-chlorophenethyl) *i*-butyl amine (20 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 338 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.92 (d, 6H), 1.99 (m, 1H), 2.90 (t, 2H), 3.02 (d, 2H), 3.56 (t, 2H), 6.87 (d, 1H), 7.11 (s, 1H), 7.21 (d, 2H), 7.23 (s, 1H), 7.34 (d, 1H), 8.31 (br, 1H).

**Example 127**1-(2-Ethoxybenzyl)-1-i-Butyl-3-(thiazol-2-yl)urea

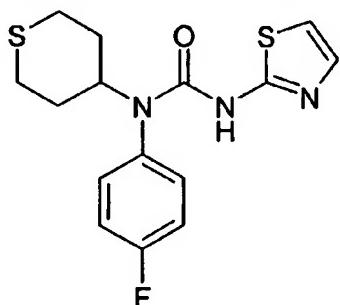
1-(2-Ethoxyphenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea (23 mg, 69%) is prepared from (2-

- 5    ethoxyphenyl) *i*-butyl amine (20 mg, 0.1 mmol) following the general procedure X to afford  
the title compound.

LCMS (*m/z*): 320 (M+ H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.94 (d, 6H), 1.48 (t, 3H), 2.11 (m, 1H), 3.28 (d, 2H), 4.17 (q,  
2H), 4.53 (s, 2H), 6.83 (d, 1H), 6.92 (dd, 1H), 7.20 (d, 1H), 7.23 (s, 1H), 7.31 (m, 2H), 8.76

- 10   (br, 1H).

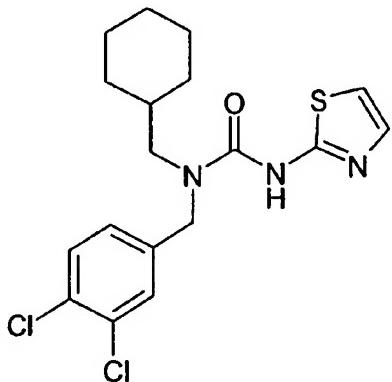
**Example 128**1-(4-Fluorophenyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea

1-(4-Fluorophenyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea (25 mg, 73.7%) is

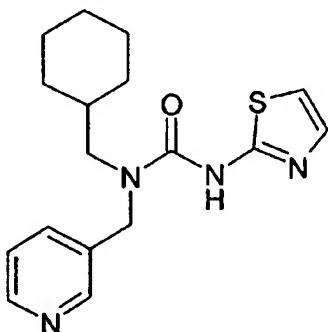
- 15   prepared from 4-fluorophenyl 4-tetrahydrothiopyranyl amine (21 mg, 0.1 mmol) following the  
general procedure X to afford the title compound.

LCMS (*m/z*): 338 (M+ H)<sup>+</sup>

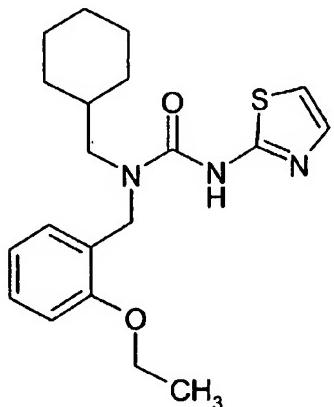
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.49 (m, 2H), 2.20 (d, 2H), 2.65 (d, 2H), 2.84 (2H), 4.51 (m,  
1H), 6.86 (d, 1H), 7.19 (d, 2H), 7.21 (d, 1H), 7.25 (d, 2H), 7.46 (br, 1H).

**Example 129**1-(3,4-Dichlorobenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea

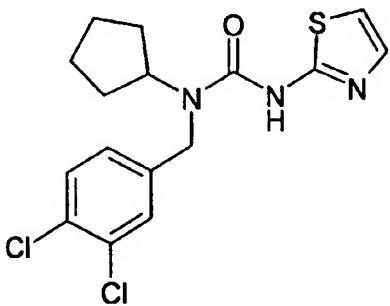
- 1-(3,4-Dichlorobenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea (30 mg, 75.6%) is prepared from N-(3,4-dichlorobenzyl)-N-(cyclohexylmethyl)amine (26 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 398 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.92 (m, 2H), 1.16-1.23 (m, 3H), 1.69-1.74 (m, 6H), 3.11 (d, 2H), 4.58 (s, 2H), 6.88 (d, 1H), 7.10 (d, 1H), 7.30 (d, 2H), 7.32 (s, 1H), 8.58 (br, 1H).

**Example 130**1-(3-Methylpyridine)-1-(cyclohexylmethyl)-3-(thiazol-2-yl)urea

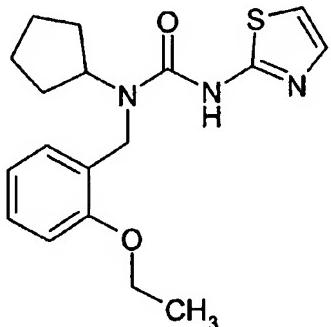
- 1-(3-Pyridinylmethyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea (26 mg, 78.8 %) is prepared from N-(3-pyridinylmethyl)-N-(cyclohexylmethyl)amine (20 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 331 (M+ H)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.25 (m, 4H), 1.56 (m, 6H), 1.74 (m, 1H), 2.17 (d, 2H), 4.63 (s, 2H), 6.88 (d, 1H), 6.93 (d, 1H), 7.29 (s, 1H), 7.34 (d, 1H), 7.66 (d, 1H), 8.54 (d, 1H), 9.45 (br, 1H).

**Example 131**1-(2-Ethoxybenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea

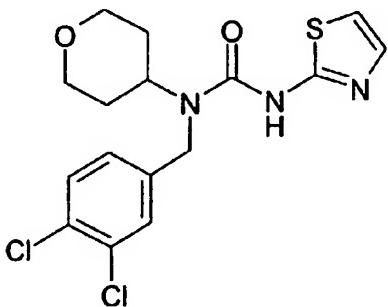
- 1-(2-Ethoxybenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea (29 mg, 77.7 %) is  
 5 prepared from N-(2-ethoxybenzyl)-N-(cyclohexylmethyl)amine (24 mg, 0.1 mmol) following  
 the general procedure X to afford the title compound.  
 LCMS (*m/z*): 374 (M+ H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.98 (m, 2H), 1.16-1.26 (m, 2H), 1.49 (t, 3H), 1.64 (m, 1H),  
 1.68-1.84 (m, 6H), 3.28 (d, 2H), 4.14 (q, 2H), 4.53 (s, 2H), 6.84 (d, 1H), 6.94 (dd, 1H), 7.21  
 10 (d, 1H), 7.24 (s, 1H), 7.29 (d, 2H), 8.82 (br, 1H).

**Example 132**1-(3,4-Dichlorobenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea

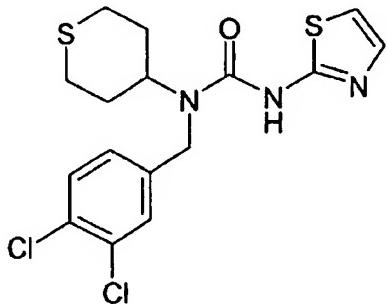
- 1-(3,4-Dichlorobenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea (25 mg, 67.8 %) is  
 15 prepared from N-(3,4-dichlorobenzyl)-N-cyclopentyl amine (24 mg, 0.1 mmol) following the  
 general procedure X to afford the title compound.  
 LCMS (*m/z*): 370 (M+ H)<sup>+</sup>  
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.29 (m, 2H), 1.48-1.66 (m, 4H), 1.92 (m, 2H), 3.12 (m, 1H),  
 4.48 (s, 2H), 6.87 (d, 1H), 7.01 (dd, 1H), 7.31 (d, 1H), 7.38 (d, 1H), 7.42 (s, 1H), 8.76 (br,  
 20 1H).

**Example 133**1-(2-Ethoxybenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea

1-(2-Ethoxybenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea (26 mg, 75.3 %) is prepared  
 5 from N-(2-ethoxybenzyl)-N-cyclopentyl amine (21 mg, 0.1 mmol) following the general procedure X to afford the title compound.  
 LCMS (*m/z*): 346 (M+ H)<sup>+</sup>.

**Example 134**1-(3,4-Dichlorobenzyl)-1-(4-tetrahydropyranyl)-3-(thiazol-2-yl)urea

10 1-(3,4-Dichlorobenzyl)-1-(4-tetrahydropyranyl)-3-(thiazol-2-yl)urea (31 mg, 80.5 %) is prepared from N-(3,4-dichlorobenzyl)-N-(4-tetrahydropyranyl) amine (25 mg, 0.1 mmol) following the general procedure X to afford the title compound.  
 LCMS (*m/z*): 386 (M+ H)<sup>+</sup>.

**Example 135**1-(3,4-Dichlorobenzyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea

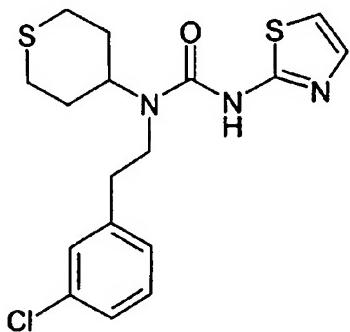
1-(3,4-Dichlorobenzyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea (33 mg, 82.3

- 5 %) is prepared from N-(3,4-dichlorobenzyl)-N-(4-tetrahydrothiopyranyl) amine (28 mg, 0.1 mmol) following the general procedure X to afford the title compound.

LCMS (*m/z*): 402 (M+ H)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.25 (m, 2H), 1.74 (m, 4H), 2.04 (m, 2H), 4.25 (m, 1H), 4.51 (s, 2H), 6.85 (d, 1H), 7.07 (dd, 1H), 7.24 (s, 1H), 7.34 (d, 1H), 7.42 (d, 1H), 8.45 (br, 1H).

10 **Example 136**

1-(3-Chlorophenethyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea


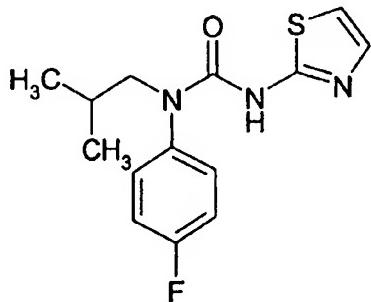
1-(3-Chlorophenethyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea (25 mg, 65.3

- %) is prepared from N-(3-chlorophenethyl)-N-(4-tetrahydrothiopyranyl) amine (26 mg, 0.1

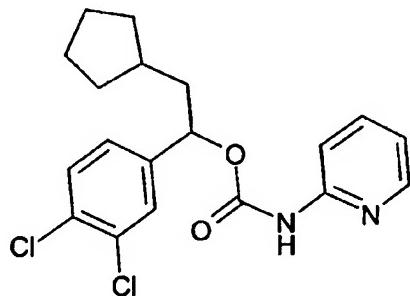
- 15 mmol) following the general procedure X to afford the title compound.

LCMS (*m/z*): 382 (M+ 1)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.24 (m, 2H), 1.87 (t, 2H), 2.63-2.75 (m, 4H), 2.89 (t, 2H), 3.47 (t, 2H), 4.08 (m, 1H), 6.87 (d, 1H), 7.08 (dd, 1H), 7.18 (s, 1H), 7.20-7.23 (m, 2H), 7.30 (d, 1H), 9.14 (br, 1H).

**Example 137**1-(4-Fluorophenyl)-1-i-butyl-3-(thiazol-2-yl)urea

- 1-(4-Fluorophenyl)-1-(i-Butyl)-3-(thiazol-2-yl)urea (19 mg, 64.8%) is prepared from N-(4-fluorophenyl)-N-i-butyl amine (16 mg, 0.1 mmol) following the general procedure X to afford the title compound.
- LCMS (*m/z*): 294 (M+ 1)<sup>+</sup>
- <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.96 (d, 6H), 2.82 (m, 1H), 4.13 (d, 2H), 6.83 (d, 1H), 6.89 (dd, 1H), 7.17 (d, 1H), 7.22 (d, 1H), 7.24 (d, 1H), 7.29 (d, 1H), 8.28 (br, 1H).

**10 Example 138**2-Cyclopentyl-1-(3,4-dichlorophenyl)ethyl pyridin-2-ylcarbamate

- To a solution of cyclopentyl acetic acid (0.64 g, 5.00 mmol) in DCM (50 ml) is added N,O-dimethylhydroxyl amine hydrochloride (0.80 g, 5.00 mmol) and triethylamine (0.696 ml, 5.00 mmol). The mixture is stirred at rt for 5 min. DCC (1.03 g, 5.00 mmol) is added to solution. After 3 h the solution is then concentrated *in vacuo*, the residue is suspended in a minimum of acetone and insoluble white solid is removed by filtration. The filtrate is evaporated to dryness. Silica gel chromatography with hexanes – ethyl acetate (95:5 to 70:30) as eluent afforded N,O-dimethyl cyclopentylamide (0.72 g, 84.2%) as white solid.
- LC-MS: *m/z* 172 (M+1)<sup>+</sup>.
- Metallic magnesium (0.073 g, 3.00 mmol) in THF (25 ml) is treated with 1-bromo-3,4-dichlorobenzene (0.565 g, 2.50 mmol). A catalytic amount of iodine (0.005 g) is added, and the solution is stirred at rt until orange color disappeared. N,O-dimethyl cyclopentylamide

(0.43 g, 2.50 mmol) is added to the reaction mixture. After 4 h the mixture is given an aqueous workup. Concentration in vacuo afforded 1-(3,4-dichlorophenyl)-2-cyclopentyl ethanol (0.613 g, 94.5%) as an oil.

1-(3,4-Dichlorophenyl)-2-cyclopentyl ethanol (0.259 g, 1.0 mmol) in DCM (10 ml) is treated with TEA (0.2 ml, 1.50 mmol) and phosgene (0.75 ml, 1.50 mmol, in 20% toluene) at -20 °C. After 3 h excess phosgene and triethylamine are removed *in vacuo* to give the desired product 1-(3,4-dichlorophenyl) 2-cyclopentylethyl chloroformate (0.25 g, 77.6%) as an oil.

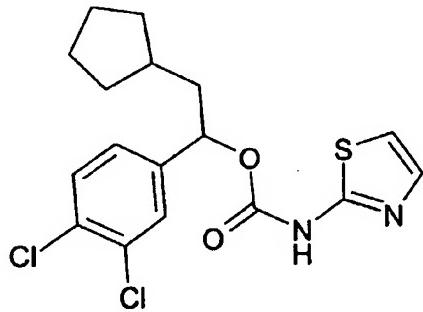
To a solution of 1-(3,4-dichlorophenyl)-2-cyclopentylethyl chloroformate (0.16 g, 0.50 mmol) in DCM (5 ml) is added DIEA (0.17 ml, 1.0 mmol) and 2-aminopyridine (0.047 g, 0.5 mmol). The mixture is given an aqueous workup. Concentration in vacuo affords 2-cyclopentyl-1-(3,4-dichlorophenyl)ethyl pyridin-2-ylcarbamate (0.153 g, 80.9%) as an oil.

LC-MS: *m/z* 379 (M+1)<sup>+</sup>

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 1.12-1.24 (m, 2H), 1.50-1.54 (m, 4H), 1.58 (m, 2H), 1.76-1.83 (m, 2H), 2.55 (m, 1H), 5.62 (t, 1H), 6.95 (d, 1H), 7.20 (d, 1H), 7.38 (s, 1H), 7.41 (m, 2H), 7.45 (d, 1H), 8.00 (d, 1H), 9.46 (br, 1H).

### Example 139

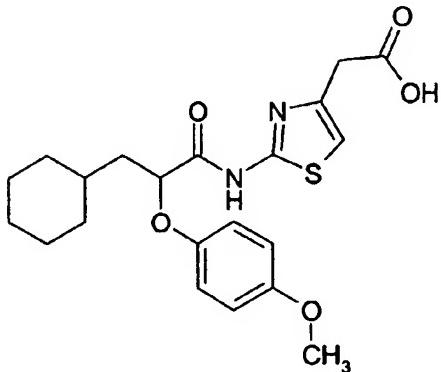
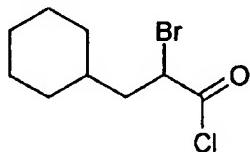
#### 2-Cyclopentyl-1-(3,4-dichlorophenyl)ethyl 1,3-thiazol-2-ylcarbamate



1-(3,4-dichlorophenyl)-2-cyclopentylethyl chloroformate (0.16 g, 0.50 mmol) is synthesized from 1-(3,4-dichlorophenyl)-2-cyclopentylethanol according to general procedure T. The chloroformate is subjected to general procedure U employing 2-aminothiazole to afford 2-cyclopentyl-1-(3,4-dichlorophenyl)ethyl 1,3-thiazol-2-ylcarbamate (0.175 g, 90.9%) as an oil.

LC-MS: *m/z* 385 (M+1)<sup>+</sup>

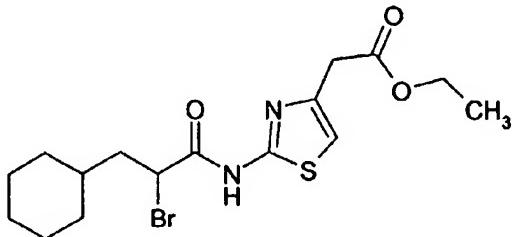
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>): δ 0.94-1.12 (m, 2H), 1.46-1.60 (m, 6H), 1.70-1.82 (m, 2H), 2.51 (m, 1H), 4.64 (t, 1H), 7.12 (d, 1H), 7.42 (d, 1H), 7.94 (d, 1H), 8.30 (d, 1H), 8.54 (dd, 1H), 9.62 (br, 1H).

**Example 140**(2-[3-Cyclohexyl-2-(4-methoxyphenoxy)propionylamino]thiazol-4-yl) acetic acidStep A:5 Preparation of 2-bromo-3-cyclohexylpropionyl chloride

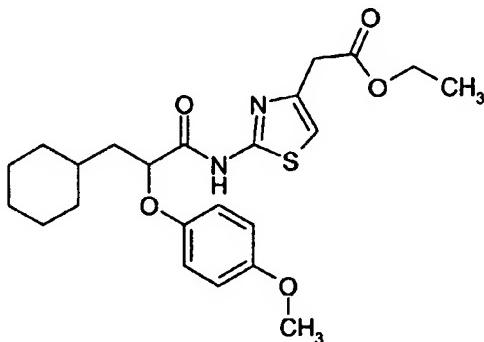
3-Cyclohexylpropionic acid (14.9 g, 95.7 mmol) was dissolved in CCl<sub>4</sub> (15 ml), SOCl<sub>2</sub> (27.6 ml, 382.9 mmol) was added and the reaction mixture was heated at 65°C for 30 min. The reacton mixture was cooled and finely powdered N-Bromosuccinimide (20.4 g, 10 114.8 mmol) was added successively, then additional CCl<sub>4</sub> (75 ml) was added and finally 15 drops of 48% hydrogen bromide was added. The reaction mixture was heated at 70°C for 10 min and then at 85°C until the color of the reaction became light yellow (about 2 hours).

The reaction mixture was cooled to RT and the solvent and excess thionyl chloride was removed under reduced pressure. The residue was suction filtered and the solid was washed with CCl<sub>4</sub> (2x30ml). Solvent was removed and the residue oil was distilled using a short-path column giving an oil.

<sup>1</sup>H-NMR (DMSO-d<sub>6</sub>): δ 4.43 (t, 1H); 1.85 (m, 2H); 1.65 (m, 5H); 1.36 (m, 1H); 1.14 (m, 3H); 0.92 (m, 2H).

Step B:Preparation of [2-(2-bromo-3-cyclohexylpropionylamino)thiazol-4-yl]acetic acid ethyl ester

- The above 2-bromo-3-cyclohexylpropionyl chloride (1.0 g, 3.94 mmol) was dissolved  
5 in THF (15 ml), Ethyl 2-amino-4-thiazoleacetate (1.5 g, 7.9 mmol) was added, standing O/N.  
Additional THF (20 ml) was added and the reaction mixture was filtered. The filtrate was  
evaporated *in vacuo* giving an yellow-coloured oil.  
<sup>1</sup>H-NMR (DMSO-d<sub>6</sub>): Selected data δ 12.59 (s, 1H); 7.07 (s, 1H); 4.71 (t, 3H); 4.09 (t, 2H);  
3.70 (s, 2H); 1.18 (t, 3H).  
10 HPLC-MS (Method B): m/z = 405 (M+1); R<sub>t</sub> = 4.61 min.

Step C:Preparation of [2-(3-cyclohexyl-2-(4-methoxyphenoxy)propionylamino)thiazol-4-yl]acetic acid ethyl ester

- 15 The above [2-(2-bromo-3-cyclohexylpropionylamino)thiazol-4-yl]acetic acid ethyl  
ester (0.3 g, 0.74 mmol) was dissolved in DMF (10 ml), potassium carbonate (0.51 g, 3.72  
mmol) was added and 4-methoxyphenol (0.28g , 2.23 mmol) was added, standing about 15  
min at 50°C then the reaction mixture was standing O/N at 75°C. The reaction-mixture was  
poured into water (30 ml) and extracted with EtOAc (50 ml) which again was washed with  
20 water (3x15ml).

The solvent was removed *in vacuo* giving a brown-coloured oil which was purified on Waters Deltaprep 4000 (20--->90% CH<sub>3</sub>CN 40min., 20ml/min., Rt=35min Solvent A=water,  
solvent B=CH<sub>3</sub>CN, solvent C=0.5% TFA/water).

HPLC-MS (Method B): m/z = 447 (M+1); R<sub>t</sub> = 4.92 min

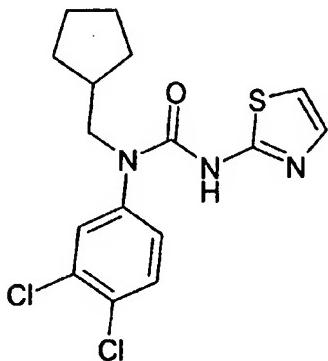
**Step D:**

The above [2-(3-cyclohexyl-2-(4-methoxyphenoxy)propionylamino)thiazol-4-yl]acetic acid ethyl ester (0.05 g, 0.11 mmol) was dissolved in EtOH (5 ml), NaOH (1N, 1 ml) was added and the reaction-mixture was standing 2 hours. The solvent was evaporated *in vacuo*,

- 5 water (5 ml) was added and pH was adjusted with 1N HCl to acidic. The resulting precipitation was filtered, washed with water and dried in a vacuum-oven to give the title compound.

<sup>1</sup>H-NMR (DMSO-d<sub>6</sub>): Selected data δ 12.51 (s, 1H); 12.41(s, 1H); 6.98 (s, 1H); 6.84 (s, 4H); 4.85 (m, 1H); 3.67 (s, 3H); 3.60 (s, 2H);

- 10 HPLC-MS (Method B): m/z = 419 (M+1); R<sub>t</sub> = 4.74 min

**Example 141****1-Cyclopentylmethyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea**

- 3,4-Dichloroaniline (16.1 g, 100 mmol) is dissolved in dry THF (200 ml) in a round-bottomed flask, and then cyclopentylcarboxyaldehyde (9.81 g, 100 mmol) is added to the solution and stirred for 10 min at rt. Molecular sieves (4 g, 4 Å) is added to the reaction mixture followed by addition of sodium triacetoxyborohydride (21.1 g, 200 mmol) and the mixture stirred at 25°C for 12 h. The reaction mixture is then filtered through silica gel, washed with saturated sodium bicarbonate (200 ml) and extracted with ethyl acetate (3x200 ml). The organic extracts are combined, dried (sodium sulfate), filtered, and condensed *in vacuo* to give *N*-cyclopentylmethyl-3,4-dichloroaniline (23.8 g, 98.7%) as an oil (LC-MS: m/z = 245 (M+1), R<sub>t</sub> = 2.92 min).

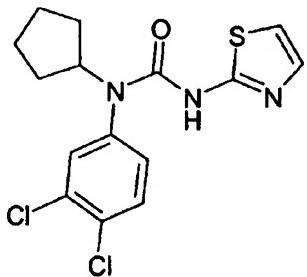
- N*-cyclopentylmethyl-3,4-dichloroaniline (1.21 g, 5.00 mmol) is dissolved in dry DCM (25 ml) and triethylamine (1.4 ml, 10.0 mmol) is added to the solution. Then triphosgene (2.97 g, 10.0 mmol) is added at -20°C and resulting mixture is stirred and allowed to warm up to 25°C within 3 h. On warming to rt., 2-aminothiazole (0.50 g, 5.0 mmol) is added to the reaction mixture and stirred for 12 h. Followed by TLC and LC-MS, upon consumption of

starting material, the mixture is washed with water (50 ml) and extracted with ethyl acetate (3x50 ml). The organic extracts are combined, dried (sodium sulfate), filtered, and condensed *in vacuo* to give 1-cyclopentyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea (1.42 g, 76.5%) as a pale yellow solid.

5           LC-MS: *m/z* 371 (M+1)<sup>+</sup>

**Example 142**

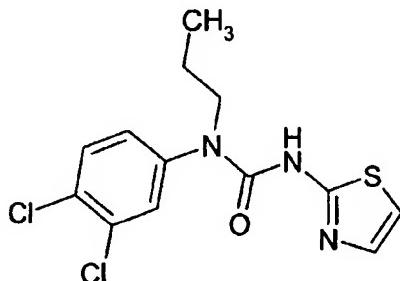
**1-Cyclopentyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea**



Sodium triacetoxyborohydride (5.3 g, 25.0 mmol) is added batchwise to a stirred  
10 solution of 3,4-dichloroaniline (1.62 g, 10.0 mmol), cyclopentanone (1.80 ml, 20.0 mmol) and  
acetic acid (3.4 ml, 60.0 mmol) in 75 ml 1,2-dichloroethane. The resulting suspension is  
stirred for 48 h at 25°C. The reaction mixture is given an aqueous workup with aqueous  
sodium bicarbonate and ethyl acetate. The combined organic extracts are dried and  
concentrated *in vacuo* to give N-cyclopentyl-3,4-dichloroaniline which is used without further  
15 purification.

Carbonyldiimidazole (178 mg, 1.1 mmol) is added to a THF solution of N-  
cyclopentyl-3,4-dichloroaniline (230 mg, 1.0 mmol). The mixture is stirred for 1 h at 25°C,  
after which time 2-aminothiazole (100 mg, 1.0 mmol) is added. The reaction is then stirred for  
16 h at 25°C. The reaction mixture is concentrated and residue purified by silica gel  
20 chromatography to afford 1-cyclopentyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea as a solid  
(30 mg, 10% yield).

LC-MS: *m/z* 379 (M+1)<sup>+</sup>

**Example 143****1-(3,4-Dichloro-phenyl)-1-propyl-3-thiazol-2-yl-urea**

2-Aminothiazole (5.0 g, 50.0 mmol) is dissolved in DCE (20 ml), then solid

- 5 supported 2-(4-formyl-3-methoxyphenoxy) ethyl polystyrene (6.9 g, 10.0 mmol, loading: 1.46 mmol/g) is added to the solution and stirred for 30 min. Acetic acid (2.1 ml, 5.0 mmol) is added to the mixture followed by addition of sodium triacetoxyborohydride (10.56 g, 50.0 mmol). The resin mixture is shaken at rt for 16 h, then washed with three cycles of DMF/methanol/DCM. Then the resin is dried *in vacuo* to give solid-supported 2-aminothia-
- 10 zole.

- The corresponding above solid-supported starting material 2-amino thiazoyl-N-2-(3-methoxybenzyloxy)ethyl polystyrene (5.0 g, 7.3 mmol) is treated with triphosgene (5.30 g, 17.8 mmol) in the presence of DCM (25 ml) and diisopropylethylamine (7.63 ml, 43.8 mmol). The product on solid support is then washed with DCM. Then the resin is dried *in vacuo* to give corresponding carbamyl chloride *N* [2-(3-methoxybenzyloxy)ethyl polystyrene-2-amino thiazoyl chloride.
- 15

- The corresponding carbamyl chloride resin (1.0 g, 1.46 mmol) is treated with 3,4-dichloroaniline (1.17 g, 7.30 mmol) in the presence of DCE (25 ml) and diisopropylethylamine (2.54 ml, 14.6 mmol). The product on solid support is then washed with three cycles of DMF/methanol/DCM, dried *in vacuo* to give corresponding urea *N* [2-(3-methoxybenzyloxy)ethyl polystyrene-2-amino thiazoyl-*N*'-3,4-dichlorophenyl urea.

- To the corresponding urea (*N* [2-(3-methoxybenzyloxy)ethyl polystyrene-2-amino thiazoyl-3,4-dichlorophenyl urea) (0.117 g, 0.73 mmol) is added potassium *t*-butoxide (3.65 ml, 3.65 mmol, 1M solution in THF). The resin mixture is shaken for 1 h at rt, and then 1-bromopropane (0.332 ml, 3.65 mmol) is added to the resin mixture and shaken for 16 h. The product on solid support is then washed with three cycles of DMF/methanol/DCM, dried *in vacuo* to give corresponding propylated urea *N* [2-(3-methoxybenzyloxy)ethyl polystyrene-2-amino thiazoyl, *N*-(3,4-dichlorophenyl)-*N*'-propyl urea.
- 25

129

The corresponding above urea is then treated with TFA (5 ml, 5% DCM solution) to cleave the solid support to give the title compound 1-(3,4-dichloro-phenyl)-1-propyl-3-thiazol-2-yl-urea (0.163 g, 67.9%) as a pale yellow solid.

LC-MS: *m/z* 331 (M+1)<sup>†</sup>

**BIOLOGICAL ASSAY****Glucokinase Activity Assay (I)**

Glucokinase activity is assayed spectrometrically coupled to glucose 6-phosphate dehydrogenase to determine compound activation of glucokinase. The final assay contains 5 50 mM Hepes, pH 7.1, 50 mM KCl, 5 mM MgCl<sub>2</sub>, 2 mM dithiothreitol, 0.6 mM NADP, 1 mM ATP, 0.195 µM G-6-P dehydrogenase (from Sigma), 15 nM recombinant human glucokinase. The glucokinase is human liver glucokinase N-terminally truncated with an N-terminal His-tag ((His)<sub>8</sub>-VEQILA.....Q466) and is expressed in E.coli as a soluble protein with enzymatic activity comparable to liver extracted GK. This glucokinase is minor splice variant from 10 human liver (Proc. Natl. Acad. Sci. U.S.A. 88, 7294-7297 (1991). As stated, the gene is truncated N-terminally and with a His-tag ((His<sub>8</sub>)- VEQILA.....Q466), according to standard procedures. The truncated form represents both GK variants from liver and the pancreatic glucokinase, the amino acid sequence being fully conserved downstream of the first 15 amino acids N-terminally. The protein is expressed as a soluble protein in E.coli BL21 DE3 15 under control of the T7 promoter. The enzymatic activity of the His-tagged, N-terminally truncated recombinant glucokinase is comparable to liver extracted GK. Purification of His-tagged Human Glucokinase (hGK) is performed as follows: E. coli cell pellet from 50 ml culture is resuspended in 5 ml extraction buffer A (25 mM HEPES, pH 8.0, 1 mM MgCl<sub>2</sub>, 150 mM NaCl, 2 mM Mercaptoethanol) with addition of 0.25 mg/ml lysozyme and 50 µg/ml 20 sodium azide. After 5 minutes at room temperature 5 ml of extraction buffer B (1.5 M NaCl, 100 mM CaCl<sub>2</sub>, 100 mM MgCl<sub>2</sub>, 0.02 mg/ml DNase 1, Protease inhibitor tablet: 1 tablet pr. 20 ml buffer) is added. The extract is then centrifugated at 15.000 g for 30 minutes. The resulting supernatant is loaded on a 1 ml Metal Chelate Affinity Chromatography (MCAC) 25 Column charged with Ni<sup>2+</sup>. The column is washed with 2 volumes buffer A containing 20 mM imidazole and the bound his-tagged hGK is subsequently eluted using a 20 minute gradient of 20 to 500 mM imidazole in buffer A. Fractions are examined using SDS-gel electrophoresis, and fractions containing hGK (MW: 52 KDa) are pooled. Finally a gelfiltration 30 step is used for final polishing and buffer exchange. hGK containing fractions are loaded onto a Superdex 75 (16/60) gelfiltration column and eluted with Buffer B (25 mM HEPES, pH 8.0, 1 mM MgCl<sub>2</sub>, 150 mM NaCl, 1 mM Dithiothreitol). The purified hGK is examined by SDS-gel electrophoresis and MALDI mass spectrometry and finally 20 % glycerol is added before freezing. The yield from 50 ml E. coli culture is generally approximately 2-3 mg hGK with a purity >90%.

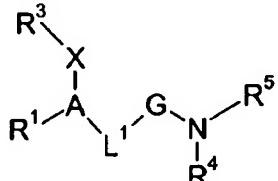
The compound to be tested is added into the well in final 2.5% DMSO concentration in an amount sufficient to give a desired concentration of compound, for instance 50  $\mu$ M. The reaction starts after glucose is added to a final concentration of 2 mM. The assay uses a 96-well UV plate and the final assay volume used is 200  $\mu$ l/well. The plate is incubated at 25°C  
5 for 5 min and kinetics is measured at 340 nm in SpectraMax every 30 seconds for 5 minutes.  
Results for each compound are expressed as the fold activation of the glucokinase activity compared to the activation of the glucokinase enzyme in an assay without compound after having been subtracted from a "blank", which is without glucokinase enzyme and without compound. The compounds in each of the Examples exhibits activation of glucokinase in this  
10 assay. A compound, which at a concentration of at or below 30  $\mu$ M gives 1.3 - fold higher glucokinase activity than the result from the assay without compound, is deemed to be an activator of glucokinase.

While the invention has been described and illustrated with reference to certain preferred embodiments thereof, those skilled in the art will appreciate that various changes, 15 modifications and substitutions can be made therein without departing from the spirit and scope of the present invention. For example, effective dosages other than the preferred dosages as set forth herein may be applicable as a consequence of variations in the responsiveness of the mammal being treated for glucokinase-deficiency mediated disease(s). Likewise, the specific pharmacological responses observed may vary according 20 to and depending on the particular active compound selected or whether there are present pharmaceutical carriers, as well as the type of formulation and mode of administration employed, and such expected variations or differences in the results are contemplated in accordance with the objects and practices of the present invention.

## CLAIMS

1. A carboxamide or sulfonamide activator of glucokinase having a heteroatom in the alpha, beta, or gamma position relative to the carboxamide or sulfonamide, respectively.

2. A compound of the general formula (I)



5

(I)

wherein

G is  $-S(O_2)-$ , or  $-C(O)-$ ;

A is  $>N-$ , and

10 X is a direct bond,  $-O-$ ,  $-S-$ ,  $-S(O)-$ ,  $-S(O_2)-$ , or  $-N(R^8)-$ , wherein

$R^8$  is hydrogen or alkyl, which may optionally be substituted with one or more substituents  $R^{16}$ ,  $R^{17}$ , and  $R^{18}$ , and

$L^1$  is  $-(CH_2)_n-C(R^9)(R^{10})_m-Y-$ , or a direct bond, wherein

n is an integer of from 1 to 6,

15  $R^9$  and  $R^{10}$  independently of each other are selected from alkyl, or cycloalkyl, optionally substituted by one or more substituents  $R^{19}$ ,  $R^{20}$ , and  $R^{21}$ ; or from aryl optionally substituted by one or more substituents  $R^{40}$ ,  $R^{41}$ ,  $R^{42}$ , and  $R^{43}$ ,

m is an integer of 0 to 1, and

20 Y is a direct bond,  $-O-$  or  $-N(R^7)-$ , wherein

$R^7$  is hydrogen or alkyl, which may optionally be substituted with one or more substituents  $R^{22}$ ,  $R^{23}$ , and  $R^{24}$ ;

or

25 X is alkylene, which may optionally be substituted with one or more substituents  $R^{25}$ ,  $R^{26}$ , and  $R^{27}$ , or a direct bond, and

$L^1$  is  $-O-$ , or  $-N(R^8)-$ , wherein

$R^8$  is hydrogen or alkyl, which may optionally be substituted with one or more substituents  $R^{28}$ ,  $R^{29}$ , and  $R^{30}$ ;

or

30 A is  $>C(R^2)-$ , wherein  $R^2$  is hydrogen or alkyl, optionally substituted with one or more substituents  $R^{31}$ ,  $R^{32}$ , and  $R^{33}$ , and

X is -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is as defined above, and

L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>-Y-, or a direct bond, wherein

n is an integer of from 1 to 6, and

Y is a direct bond, O, or -N(R<sup>7</sup>)-, wherein

R<sup>7</sup> is as defined above;

or

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>,

R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein

R<sup>8</sup> is as defined above;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylheterocyclyl, fused heterocycl-

15 heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>1</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a

20 cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or, when A is >C(R<sup>2</sup>)-, then

R<sup>1</sup> and R<sup>2</sup> may be taken together with the atoms to which they are attached to form 25 a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>2</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form

30 a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

R<sup>4</sup> is hydrogen or alkyl, optionally substituted with one or more substituents R<sup>37</sup>, R<sup>38</sup>, and R<sup>39</sup>;

and

35 R<sup>5</sup> is aryl or heteroaryl, optionally substituted with one or more substituents R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup>;

wherein

$R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22}, R^{23}, R^{24}; R^{25}, R^{26}, R^{27}, R^{28}, R^{29}, R^{30}; R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38}$ , and  $R^{39}$  independently of each other are selected from

-CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>,  
 5 -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>,  
 -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>,  
 -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;  
 C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more  
 substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

10 C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cyclo-  
 alkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio,  
 C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl,  
 C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, heterocyclyl-C<sub>1-6</sub>-alkyl,  
 heterocyclyl-C<sub>2-6</sub>-alkenyl, heterocyclyl-C<sub>2-6</sub>-alkynyl, aryl, aryloxy, aryloxycarbonyl,  
 15 aroyl, aryl-C<sub>1-6</sub>-alkoxy, aryl-C<sub>1-6</sub>-alkyl, aryl-C<sub>2-6</sub>-alkenyl, aryl-C<sub>2-6</sub>-alkynyl, heteroaryl,  
 heteroaryl-C<sub>1-6</sub>-alkyl, heteroaryl-C<sub>2-6</sub>-alkenyl and heteroaryl-C<sub>2-6</sub>-alkynyl, of which the  
 aryl and heteroaryl moieties optionally may be substituted with one or more  
 substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>,  
 -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl; and

20  $R^{40}, R^{41}, R^{42}, R^{43}, R^{44}, R^{45}, R^{46}$ , and  $R^{47}$  independently of each other are selected from

halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>,  
 -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>,  
 -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>,  
 -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>,  
 -C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>.

25 C<sub>1-6</sub>-alkyl, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one  
 or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and  
 C<sub>1-6</sub>-alkyl;

30 C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cyclo-  
 alkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio,  
 C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl,  
 C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, heterocyclyl-C<sub>1-6</sub>-alkyl,  
 heterocyclyl-C<sub>2-6</sub>-alkenyl, heterocyclyl-C<sub>2-6</sub>-alkynyl, aryl, aryloxy, aryloxycarbonyl,  
 aroyl, aryl-C<sub>1-6</sub>-alkoxy, aryl-C<sub>1-6</sub>-alkyl, aryl-C<sub>2-6</sub>-alkenyl, aryl-C<sub>2-6</sub>-alkynyl, heteroaryl,  
 35 heteroaryl-C<sub>1-6</sub>-alkyl, heteroaryl-C<sub>2-6</sub>-alkenyl and heteroaryl-C<sub>2-6</sub>-alkynyl, of which the  
 aryl and heteroaryl optionally may be substituted with one or more substituents

selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;

and

two of R<sup>40</sup>, R<sup>41</sup>, R<sup>42</sup>, and R<sup>43</sup>, or two of R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> on adjacent carbon atoms may independently be taken together to form -O-CH<sub>2</sub>-O-;

wherein

R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, aryl-C<sub>1-6</sub>-alkyl or aryl;

or

R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds; and

R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> independently of each other are selected from

halogen, perfluoroalkyl, cyano, alkyl-Z-, aryl-Z-, aryl-alkylene-Z-, N(R<sup>63</sup>)(R<sup>64</sup>)-alkylene-Z-; and R<sup>65</sup>-W-alkylene-Z-; wherein

Z and W independently of each other are selected from a direct bond, alkylene, -O-, -N(R<sup>66</sup>)-, -S-, -SO<sub>2</sub>-, -C(O)N(R<sup>66</sup>)-, -N(R<sup>66</sup>)C(O)-, -N(R<sup>66</sup>)C(O)N(R<sup>67</sup>)-, -N(R<sup>66</sup>)SO<sub>2</sub>- , -SO<sub>2</sub>N(R<sup>66</sup>)-, -C(O)C-, -OC(O)-, and -N(R<sup>66</sup>)SO<sub>2</sub>N(R<sup>67</sup>)- ; wherein

R<sup>66</sup> and R<sup>67</sup> independently of each other are hydrogen or alkyl;

R<sup>63</sup>, R<sup>64</sup>, and R<sup>65</sup> are selected from the group consisting of hydrogen, aryl, alkyl, and aryl-alkylene-; or

R<sup>63</sup> and R<sup>64</sup> may be taken together to form a ring having the formula

-(CH<sub>2</sub>)<sub>j</sub>E-(CH<sub>2</sub>)<sub>k</sub>- bonded to the nitrogen atom to which R<sup>63</sup> and R<sup>64</sup> are attached, wherein

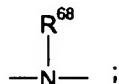
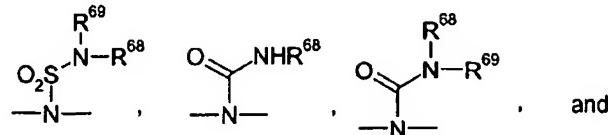
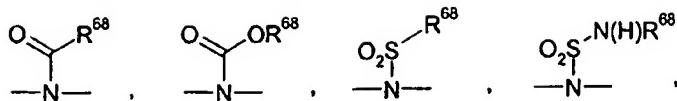
j is an integer of from 1 to 4;

k is an integer of from 1 to 4; and

E is a direct bond, -CH<sub>2</sub>-, -O-, -S-, -S(O<sub>2</sub>)-, -C(O)-, -C(O)N(H)-,

-NHC(O)-, -NHC(O)N(H)-, -NHSO<sub>2</sub>-, -SO<sub>2</sub>NH-, -C(O)O-, -OC(O)-, -NHSO<sub>2</sub>NH-,

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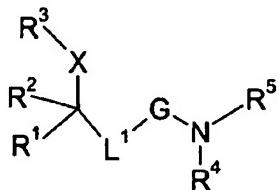
wherein

$\text{R}^{68}$  and  $\text{R}^{69}$  are selected from the group consisting of hydrogen, aryl, alkyl, and aryl-alkylene-;

5 or a pharmaceutically acceptable salt, solvate or prodrug thereof.

3. A compound according to claim 2, wherein at least one of  $\text{R}^1$  and  $\text{R}^3$  is selected from aryl-, and heteroaryl-, optionally substituted with one or more substituents  $\text{R}^{44}$ ,  $\text{R}^{45}$ ,  $\text{R}^{46}$ , and  $\text{R}^{47}$ .

4. A compound according to claim 2, which compound is of the general formula (II)



10

(II)

wherein

 $\text{G}$  is  $-\text{S}(\text{O}_2)-$ , or  $-\text{C}(\text{O})-$ ; $\text{R}^2$  is hydrogen or alkyl, which may optionally be substituted with one or more substituents  $\text{R}^{31}$ ,  $\text{R}^{32}$ , and  $\text{R}^{33}$ ;15  $\text{X}$  is  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{S}(\text{O})-$ ,  $-\text{S}(\text{O}_2)-$ , or  $-\text{N}(\text{R}^6)-$ , wherein $\text{R}^6$  is as defined in claim 2;15  $\text{L}^1$  is  $-(\text{CH}_2)_n-\text{Y}-$ , or a direct bond, wherein $n$  is an integer of from 1 to 6, $\text{Y}$  is a direct bond, O, or  $-\text{N}(\text{R}^7)-$ , wherein20  $\text{R}^7$  is as defined in claim 2; $\text{R}^1$  and  $\text{R}^3$  independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents  $\text{R}^{34}$ ,  $\text{R}^{35}$ , and  $\text{R}^{36}$ ; or

from aryl, heteroaryl, fused heterocyclaryl, fused heteroaryl(heterocyclyl, fused heterocyclyl-heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroaryl(cycloalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

5 or

R<sup>1</sup> and R<sup>2</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

10 R<sup>4</sup> is as defined in claim 2; and

R<sup>5</sup> is as defined in claim 2;

wherein R<sup>31</sup>, R<sup>32</sup>, R<sup>33</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2, or a pharmaceutically acceptable salt, solvate or prodrug thereof.

5. A compound according to claim 4, wherein

15 R<sup>1</sup> is selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or from aryl-, and heteroaryl-, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>; and

R<sup>2</sup> is hydrogen or alkyl, which may optionally be substituted with one or more

20 substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>; wherein

R<sup>31</sup>, R<sup>32</sup>, R<sup>33</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 4.

6. A compound according to any of claims 4 to 5, wherein

X is -S-, -O-, or -N(R<sup>6</sup>)-, wherein R<sup>6</sup> is as defined in claim 4.

7. A compound according to claim 6, wherein

25 X is -S-, -O-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is hydrogen or alkyl.

8. A compound according to claim 7, wherein

X is -S-, -O-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is hydrogen or C<sub>1-6</sub>-alkyl.

30 9. A compound according to claim 8, wherein

X is -S-.

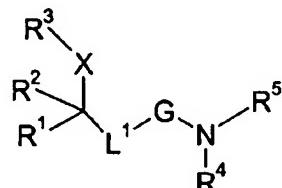
10. A compound according to claim 8, wherein

X is -O-.

11. A compound according to claim 8, wherein

X is -NH-.

5 12. A compound according to claim 2, which compound is of the general formula (II)



(II)

wherein

G is -S(O<sub>2</sub>)-, or -C(O)-;

10 R<sup>2</sup> is hydrogen or alkyl, which may optionally be substituted with one or more substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>;

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>, or a direct bond;

L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein

15 R<sup>8</sup> is as defined in claim 2;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>; or from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylhetereocycl, fused heterocycl-

20 heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylcyloalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>1</sup> and R<sup>2</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>,

25 and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>2</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>,

and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

R<sup>4</sup> is as defined in claim 2; and

R<sup>5</sup> is as defined in claim 2;

- 5 wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup>, R<sup>31</sup>, R<sup>32</sup>, R<sup>33</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2;  
or a pharmaceutically acceptable salt, solvate or prodrug thereof.

13. A compound according to claim 12, wherein

R<sup>2</sup> is hydrogen or alkyl, which may optionally be substituted with one or more substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>.

14. A compound according to claim 12 or claim 13, wherein

X is methylene.

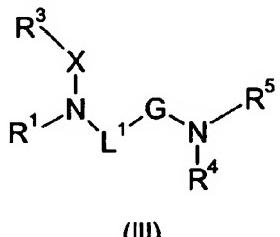
15. A compound according to claim 12 or claim 13, wherein

X is a direct bond.

- 15 16. A compound according to any of claims 12 to 15, wherein

L<sup>1</sup> is -O-.

17. A compound according to claim 2, which compound is of the general formula (III);



- 20 wherein

G is -S(O<sub>2</sub>)-, or -C(O)-; and

X is a direct bond, -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>8</sup>)-, wherein

R<sup>8</sup> is as defined in claim 2, and

L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>- C(R<sup>9</sup>)(R<sup>10</sup>)<sub>m</sub>-Y-, or a direct bond, wherein

25 n is an integer of from 1 to 6,

R<sup>9</sup> and R<sup>10</sup> are as defined in claim 2;

m is an integer of 0 to 1, and

Y is a direct bond, -O- or -N(R<sup>7</sup>)-, wherein

R<sup>7</sup> is as defined in claim 2;

or

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

5 L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-; wherein

R<sup>8</sup> is as defined in claim 2;

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocycl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, or from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylhetereocycl, fused heterocycl-

10 heteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylcyloalkyl, and fused cyloalkylheterearyl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

or

R<sup>1</sup> and R<sup>3</sup> may be taken together with the atoms to which they are attached to form a

15 cycloalkyl or heterocycl ring, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>;

R<sup>4</sup> is as defined in claim 2; and

R<sup>6</sup> is as defined in claim 2;

20 wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup>, R<sup>34</sup>, R<sup>35</sup>, R<sup>36</sup>, R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2; or a pharmaceutically acceptable salt, solvate or prodrug thereof.

18. A compound according to claim 17, wherein

R<sup>1</sup> and R<sup>3</sup> independently of each other are selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocycl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, or from aryl-, and heteroaryl-, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>.

19. A compound according to any of claims 2 to 18, wherein

R<sup>2</sup> is hydrogen or C<sub>1-8</sub>-alkyl, which may optionally be substituted with one or more substituents R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup>; wherein

30 R<sup>31</sup>, R<sup>32</sup>, and R<sup>33</sup> are as defined in claim 2.

20. A compound according to claim 19, wherein

R<sup>2</sup> is hydrogen.

21. A compound according to any of claims 2 to 20, wherein

R<sup>3</sup> is selected from C<sub>1-8</sub>-alkyl, C<sub>2-8</sub>-alkenyl, and C<sub>2-8</sub>-alkynyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

5 22. A compound according to claim 21, wherein

R<sup>3</sup> is selected from C<sub>1-8</sub>-alkyl, C<sub>2-8</sub>-alkenyl, and C<sub>2-8</sub>-alkynyl, substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

23. A compound according to claim 21, wherein

10 R<sup>3</sup> is C<sub>1-8</sub>-alkyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

24. A compound according to claim 23, wherein

15 R<sup>3</sup> is C<sub>1-8</sub>-alkyl substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

25. A compound according to claim 23, wherein

R<sup>3</sup> is C<sub>1-8</sub>-alkyl, optionally substituted with one substituent R<sup>34</sup>, wherein  
R<sup>34</sup> is as defined in claim 2.

26. A compound according to claim 25, wherein

20 R<sup>3</sup> is C<sub>1-8</sub>-alkyl substituted with one substituent R<sup>34</sup>, wherein  
R<sup>34</sup> is as defined in claim 2.

27. A compound according to claim 25, wherein

R<sup>3</sup> is C<sub>1-3</sub>-alkyl, optionally substituted with one substituent R<sup>34</sup>, wherein  
R<sup>34</sup> is as defined in claim 2.

25 28. A compound according to claim 27, wherein

R<sup>3</sup> is C<sub>1-3</sub>-alkyl substituted with one substituent R<sup>34</sup>, wherein  
R<sup>34</sup> is as defined in claim 2.

29. A compound according to any of claims 21 to 28, wherein

- $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from  $-CHF_2$ ,  $-CF_3$ ,  $-OCF_3$ ,  
 $-OCHF_2$ ,  $-OCH_2CF_3$ ,  $-OCF_2CHF_2$ ,  $-S(O)_2CF_3$ ,  $-SCF_3$ ,  $-OR^{52}$ ,  $-NR^{52}R^{53}$ ,  $-SR^{52}$ ,  
 $-NR^{52}S(O)_2R^{53}$ ,  $-S(O)_2NR^{52}R^{53}$ ,  $-S(O)NR^{52}R^{53}$ ,  $-S(O)R^{52}$ ,  $-S(O)_2R^{52}$ ,  $-C(O)NR^{52}R^{53}$ ,  
 $-OC(O)NR^{52}R^{53}$ ,  $-NR^{52}C(O)R^{53}$ ,  $-CH_2C(O)NR^{52}R^{53}$ ,  $-OCH_2C(O)NR^{52}R^{53}$ ,  $-CH_2OR^{52}$ ,  
5  $-CH_2NR^{52}R^{53}$ ,  $-OC(O)R^{52}$ ,  $-C(O)R^{52}$  and  $-C(O)OR^{52}$ ;
- $C_{2-6}$ -alkenyl and  $C_{2-6}$ -alkynyl, which may optionally be substituted with one or more substituents selected from  $-CN$ ,  $-CF_3$ ,  $-OCF_3$ ,  $-OR^{52}$ ,  $-NR^{52}R^{53}$  and  $C_{1-6}$ -alkyl;  
 $C_{3-8}$ -cycloalkyl,  $C_{4-8}$ -cycloalkenyl,  $C_{3-8}$ -heterocyclyl,  $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkyl,  
 $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkoxy,  $C_{3-8}$ -cycloalkyloxy,  $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkylthio,  
10  $C_{3-8}$ -cycloalkylthio,  $C_{3-8}$ -cycloalkyl- $C_{2-6}$ -alkenyl,  $C_{3-8}$ -cycloalkyl- $C_{2-6}$ -alkynyl,  
 $C_{4-8}$ -cycloalkenyl- $C_{1-6}$ -alkyl,  $C_{4-8}$ -cycloalkenyl- $C_{2-6}$ -alkenyl,  $C_{4-8}$ -cycloalkenyl- $C_{2-6}$ -alkynyl,  $C_{3-8}$ -heterocyclyl- $C_{1-6}$ -alkyl,  $C_{3-8}$ -heterocyclyl- $C_{2-6}$ -alkenyl,  
 $C_{3-8}$ -heterocyclyl- $C_{2-6}$ -alkynyl,  $C_{6-18}$ -aryl,  $C_{6-18}$ -aryloxy,  $C_{6-18}$ -aryloxycarbonyl,  
 $C_{6-18}$ -aroyl,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkoxy,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkyl,  $C_{6-18}$ -aryl- $C_{2-6}$ -alkenyl,  
15  $C_{6-18}$ -aryl- $C_{2-6}$ -alkynyl,  $C_{5-18}$ -heteroaryl,  $C_{5-18}$ -heteroaryl- $C_{1-6}$ -alkyl,  
 $C_{5-18}$ -heteroaryl- $C_{2-6}$ -alkenyl and  $C_{5-18}$ -heteroaryl- $C_{2-6}$ -alkynyl, of which the  $C_{6-18}$ -aryl  
and  $C_{5-18}$ -heteroaryl moiety may optionally be substituted with one or more substituents selected from halogen,  $-C(O)OR^{52}$ ,  $-CN$ ,  $-CF_3$ ,  $-OCF_3$ ,  $-NO_2$ ,  $-OR^{52}$ ,  
 $-NR^{52}R^{53}$ , and  $C_{1-6}$ -alkyl, wherein
- 20  $R^{52}$  and  $R^{53}$  independently of each other are hydrogen,  $C_{1-6}$ -alkyl,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkyl or  $C_{6-18}$ -aryl;  
or  
 $R^{52}$  and  $R^{53}$ , when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.
- 25

## 30. A compound according to claim 29, wherein

- $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from  $C_{3-8}$ -cycloalkyl,  
 $C_{4-8}$ -cycloalkenyl,  $C_{3-8}$ -heterocyclyl,  $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkyl,  
30  $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkoxy,  $C_{3-8}$ -cycloalkyloxy,  $C_{3-8}$ -cycloalkyl- $C_{1-6}$ -alkylthio,  
 $C_{3-8}$ -cycloalkylthio,  $C_{3-8}$ -cycloalkyl- $C_{2-6}$ -alkenyl,  $C_{3-8}$ -cycloalkyl- $C_{2-6}$ -alkynyl,  
 $C_{4-8}$ -cycloalkenyl- $C_{1-6}$ -alkyl,  $C_{4-8}$ -cycloalkenyl- $C_{2-6}$ -alkenyl,  $C_{4-8}$ -cycloalkenyl- $C_{2-6}$ -alkynyl,  $C_{3-8}$ -heterocyclyl- $C_{1-6}$ -alkyl,  $C_{3-8}$ -heterocyclyl- $C_{2-6}$ -alkenyl,  
 $C_{3-8}$ -heterocyclyl- $C_{2-6}$ -alkynyl,  $C_{6-18}$ -aryl,  $C_{6-18}$ -aryloxy,  $C_{6-18}$ -aryloxycarbonyl,  
35  $C_{6-18}$ -aroyl,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkoxy,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkyl,  $C_{6-18}$ -aryl- $C_{2-6}$ -alkenyl,

- C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkynyl, C<sub>5-18</sub>-heteroaryl, C<sub>5-18</sub>-heteroaryl-C<sub>1-6</sub>-alkyl,  
C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkenyl and C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkynyl, of which the C<sub>6-18</sub>-aryl  
and C<sub>5-18</sub>-heteroaryl moiety may optionally be substituted with one or more  
substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>,  
5 -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein  
R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-  
C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;  
or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
10 said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally  
containing one or two further heteroatoms selected from nitrogen, oxygen  
and sulfur, and optionally containing one or two double bonds.

31. A compound according to claim 30, wherein

- R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-6</sub>-cycloalkyl,  
15 C<sub>6-18</sub>-aryl, or C<sub>5-18</sub>-heteroaryl, of which the C<sub>6-18</sub>-aryl and C<sub>5-18</sub>-heteroaryl optionally  
may be substituted with one or more substituents selected from halogen,  
-C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein  
R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-  
C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;  
20 or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally  
containing one or two further heteroatoms selected from nitrogen, oxygen  
and sulfur, and optionally containing one or two double bonds

25 32. A compound according to claim 31, wherein

- R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-6</sub>-cycloalkyl,  
C<sub>8-10</sub>-aryl, or C<sub>5-7</sub>-heteroaryl, of which the C<sub>8-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl optionally  
may be substituted with one or more substituents selected from halogen,  
-C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein  
30 R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl or  
C<sub>8-10</sub>-aryl;  
or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally

containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

33. A compound according to any of claims 29 to 32, wherein

R<sup>52</sup> and R<sup>53</sup> are hydrogen.

5 34. A compound according to claim 25, wherein

R<sup>3</sup> is C<sub>4-8</sub>-alkyl.

35. A compound according to claim 34, wherein

R<sup>3</sup> is C<sub>4</sub>-alkyl.

36. A compound according to any of claims 2 to 20, wherein

10 R<sup>3</sup> is selected from C<sub>3-8</sub>-cycloalkyl, and C<sub>3-8</sub>-heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

37. A compound according to claim 36, wherein

15 R<sup>3</sup> is selected from C<sub>3-8</sub>-cycloalkyl, and C<sub>3-8</sub>-heterocyclyl, substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

38. A compound according to claim 36, wherein

20 R<sup>3</sup> is selected from C<sub>5-8</sub>-cycloalkyl, and C<sub>5-8</sub>-heterocyclyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

39. A compound according to claim 38, wherein

R<sup>3</sup> is selected from C<sub>5-8</sub>-cycloalkyl, and C<sub>5-8</sub>-heterocyclyl, substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

25 40. A compound according to claim 38, wherein

R<sup>3</sup> is cyclopentyl, cyclohexyl, tetrahydropyranyl, or tetrahydrothiopyranyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

## 41. A compound according to claim 40, wherein

$R^3$  is cyclopentyl, cyclohexyl, tetrahydropyranyl, or tetrahydrothiopyranyl, substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , wherein

$R^{34}$ ,  $R^{35}$ , and  $R^{36}$  are as defined in claim 2.

## 5 42. A compound according to any of claims 36 to 41, wherein

$R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>,

10 -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, C<sub>3-8</sub>-heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio,

15 C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl,

C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, C<sub>3-8</sub>-heterocyclyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkenyl,

C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkynyl, C<sub>6-18</sub>-aryl, C<sub>6-18</sub>-aryloxy, C<sub>6-18</sub>-aryloxycarbonyl,

C<sub>6-18</sub>-aryoyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkoxy, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkenyl,

20 C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkynyl, C<sub>5-18</sub>-heteroaryl, C<sub>5-18</sub>-heteroaryl-C<sub>1-6</sub>-alkyl,

C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkenyl and C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkynyl, of which the C<sub>6-18</sub>-aryl

and C<sub>5-18</sub>-heteroaryl moiety may optionally be substituted with one or more

substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>,

-NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

25 R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-

C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;

or

R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally

30 containing one or two further heteroatoms selected from nitrogen, oxygen

and sulfur, and optionally containing one or two double bonds.

## 43. A compound according to claim 42, wherein

$R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>,

-NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

5 C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

C<sub>5-8</sub>-cycloalkyl, C<sub>5-8</sub>-cycloalkenyl, C<sub>5-8</sub>-heterocyclyl, C<sub>5-8</sub>-cycloalkyloxy,

C<sub>5-8</sub>-cycloalkylthio, C<sub>6-10</sub>-aryl, C<sub>6-10</sub>-aryloxy, C<sub>6-10</sub>-aryloxycarbonyl, C<sub>6-10</sub>-royl,

10 C<sub>5-7</sub>-heteroaryl, of which the C<sub>6-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl moiety may optionally be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-10</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

or

15 R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the

said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

**44. A compound according to claim 43, wherein**

R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>,

20 -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>,

-NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>,

-OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>,

-CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more

25 substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl,

wherein

R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-10</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

or

30 R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the

said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

**45. A compound according to any of claims 42 to 44, wherein**

R<sup>52</sup> and R<sup>53</sup> are hydrogen.

46. A compound according to claim 40, wherein

R<sup>3</sup> is cyclopentyl, cyclohexyl, tetrahydropyranyl, or tetrahydrothiopyranyl.

47. A compound according to any of claims 2 to 20, wherein

5 R<sup>3</sup> is selected from C<sub>6-18</sub>-aryl or C<sub>5-18</sub>-heteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2.

48. A compound according to claim 47, wherein

10 R<sup>3</sup> is selected from C<sub>6-12</sub>-aryl or C<sub>5-12</sub>-heteroaryl, optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2.

49. A compound according to claim 48

15 R<sup>3</sup> is selected from C<sub>6-10</sub>-aryl or C<sub>5-7</sub>-heteroaryl optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2.

50. A compound according to claim 49, wherein

R<sup>3</sup> is phenyl optionally substituted with one or more substituents R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup>, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> are as defined in claim 2.

20 51. A compound according to any of claims 47 to 50, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> independently of each other are selected from

halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>,  
-S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>,  
-S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>,  
-CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>,  
-C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>;

25 C<sub>1-6</sub>-alkyl, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and  
C<sub>1-6</sub>-alkyl;

C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, C<sub>3-8</sub>-heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl,  
 C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio,  
 C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl,  
 C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl,  
 5 C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, C<sub>3-8</sub>-heterocyclyl-C<sub>1-6</sub>-alkyl,  
 C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkynyl, C<sub>6-18</sub>-aryl, C<sub>6-18</sub>-aryloxy,  
 C<sub>6-18</sub>-aryloxycarbonyl, C<sub>6-18</sub>-aroyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkoxy, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl,  
 C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkenyl, C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkynyl, C<sub>5-18</sub>-heteroaryl,  
 C<sub>5-18</sub>-heteroaryl-C<sub>1-6</sub>-alkyl, C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkenyl and  
 10 C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkynyl, of which the C<sub>6-18</sub>-aryl and C<sub>5-18</sub>-heteroaryl optionally  
 may be substituted with one or more substituents selected from halogen,  
 -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;  
 or  
 two of R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> on adjacent carbon atoms may independently be taken  
 15 together to form -O-CH<sub>2</sub>-O-, wherein  
 R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-  
 C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;  
 or  
 R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
 20 said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally  
 containing one or two further heteroatoms selected from nitrogen, oxygen  
 and sulfur, and optionally containing one or two double bonds.

52. A compound according to claim 51, wherein

R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> independently of each other are selected from  
 25 halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>,  
 -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>,  
 -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>,  
 -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>,  
 -C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>;  
 30 C<sub>1-6</sub>-alkyl, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one  
 or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and  
 C<sub>1-6</sub>-alkyl;  
 C<sub>5-6</sub>-cycloalkyl, C<sub>5-6</sub>-heterocyclyl, C<sub>5-6</sub>-cycloalkyloxy, C<sub>5-6</sub>-cycloalkylthio, C<sub>6-10</sub>-aryl,  
 C<sub>6-10</sub>-aryloxy, C<sub>6-10</sub>-aryloxycarbonyl, C<sub>6-10</sub>-aroyl, C<sub>5-7</sub>-heteroaryl, of which the  
 35 C<sub>6-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl moieties may optionally be substituted with one or

more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;

or

two of R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> on adjacent carbon atoms may independently be taken together to form -O-CH<sub>2</sub>-O-;

wherein

R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;

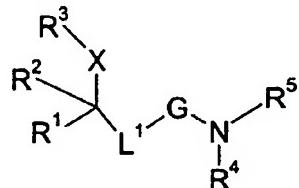
or

R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

53. A compound according to claim 51 or claim 52, wherein

15 R<sup>52</sup> and R<sup>53</sup> are hydrogen.

54. A compound according to claim 2, which compound is of the general formula (II)



(II)

wherein

20 G is -S(O<sub>2</sub>)-, or -C(O)-, and

X is -O-, -S-, -S(O)-, -S(O<sub>2</sub>)-, or -N(R<sup>6</sup>)-, wherein

R<sup>6</sup> is as defined in claim 2, and

L<sup>1</sup> is -(CH<sub>2</sub>)<sub>n</sub>-Y-, or a direct bond, wherein

n is an integer of from 1 to 6, and

25 Y is a direct bond, O, or -N(R<sup>7</sup>)-, wherein

R<sup>7</sup> is as defined in claim 2;

or

X is alkylene, which may optionally be substituted with one or more substituents R<sup>25</sup>, R<sup>26</sup>, and R<sup>27</sup>, or a direct bond, and

30 L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein

$R^8$  is as defined in claim 2;

$R^1$  is selected from alkyl, alkenyl, alkynyl, cycloalkyl, and heterocyclyl, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , or from aryl, heteroaryl, fused heterocyclaryl, fused heteroarylheterocyclyl, fused heterocyclylheteroaryl, fused arylcycloalkyl, fused cycloalkylaryl, fused heteroarylcyloalkyl, and fused cycloalkylheteroaryl, optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ ;

$R^2$  and  $R^3$  are taken together with the atoms to which they are attached to form a cycloalkyl or heterocyclyl ring, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , and optionally fused to a heteroaryl or aryl ring, optionally substituted with one or more

10 substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ ;

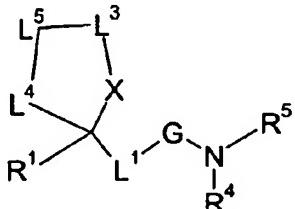
$R^4$  is as defined in claim 2; and

$R^5$  is as defined in claim 2;

wherein  $R^{25}$ ,  $R^{28}$ ,  $R^{27}$ ,  $R^{34}$ ,  $R^{35}$ ,  $R^{38}$ ,  $R^{44}$ ,  $R^{45}$ ,  $R^{48}$ , and  $R^{47}$  are as defined in claim 2;

or a pharmaceutically acceptable salt, solvate or prodrug thereof.

15 55. A compound according to claim 54 of the general formula (IIa)



(IIa)

wherein

$G$ ,  $X$ ,  $L^1$ ,  $R^1$ ,  $R^4$  and  $R^5$  are as defined in claim 54;

20  $L^3$  is  $-(C(R^{11})(R^{12}))_p-$ ;

$L^4$  is  $-(C(R^{13})(R^{14}))_q-$ ; wherein

$R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  independently of each other are hydrogen or alkyl optionally substituted with lower alkyl, phenyl or hydroxy,

$p$  is an integer of from 0 to 3, and

25  $q$  is an integer of from 0 to 3;

and

$L^5$  is a direct bond, alkenylene, alkynylene, arylene, heteroarylene,  $-O-$ ,  $-C(O)-$ ,  $-S-$ ,  $-S(O)-$ ,  $-S(O_2)-$ , or  $-N(R^{15})-$ , wherein

$R^{15}$  is hydrogen or alkyl, which may optionally be substituted with one or more

30 substituents  $R^{54}$ ,  $R^{55}$ , and  $R^{56}$ , wherein

$R^{54}$ ,  $R^{55}$ , and  $R^{56}$  are independently selected from

-CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>57</sup>, -NR<sup>57</sup>R<sup>58</sup>, -SR<sup>57</sup>, -NR<sup>57</sup>S(O)<sub>2</sub>R<sup>58</sup>, -S(O)<sub>2</sub>NR<sup>57</sup>R<sup>58</sup>, -S(O)NR<sup>57</sup>R<sup>58</sup>, -S(O)R<sup>57</sup>, -S(O)<sub>2</sub>R<sup>57</sup>, -C(O)NR<sup>57</sup>R<sup>58</sup>, -OC(O)NR<sup>57</sup>R<sup>58</sup>, -NR<sup>57</sup>C(O)R<sup>58</sup>, -CH<sub>2</sub>C(O)NR<sup>57</sup>R<sup>58</sup>, -OCH<sub>2</sub>C(O)NR<sup>57</sup>R<sup>58</sup>, -CH<sub>2</sub>OR<sup>57</sup>, -CH<sub>2</sub>NR<sup>57</sup>R<sup>58</sup>, -OC(O)R<sup>57</sup>, -C(O)R<sup>57</sup>, and -C(O)OR<sup>57</sup>;

5 C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>57</sup>, -NR<sup>57</sup>R<sup>58</sup> and C<sub>1-6</sub>-alkyl;

10 C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, heterocyclil, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, heterocyclil-C<sub>1-6</sub>-alkyl, heterocyclil-C<sub>2-6</sub>-alkenyl, heterocyclil-C<sub>2-6</sub>-alkynyl, aryl, aryloxy, aryloxycarbonyl, aroyl, aryl-C<sub>1-6</sub>-alkoxy, aryl-C<sub>1-6</sub>-alkyl, aryl-C<sub>2-6</sub>-alkenyl, aryl-C<sub>2-6</sub>-alkynyl, heteroaryl, heteroaryl-C<sub>1-6</sub>-alkyl, heteroaryl-C<sub>2-6</sub>-alkenyl and heteroaryl-C<sub>2-6</sub>-alkynyl, of which the aryl and heteroaryl moieties optionally may be substituted with one or more substituents selected from halogen, -C(O)OR<sup>57</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>57</sup>, -NR<sup>57</sup>R<sup>58</sup> and C<sub>1-6</sub>-alkyl;

15 20 wherein R<sup>57</sup> and R<sup>58</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, aryl-C<sub>1-6</sub>-alkyl or aryl,

or

25 R<sup>57</sup> and R<sup>58</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

56. A compound according to claim 55, wherein

30 R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> independently of each other are selected from hydrogen and alkyl.

57. A compound according to claim 56, wherein

R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> independently of each other are selected from hydrogen and C<sub>1-6</sub>-alkyl.

58. A compound according to any of claims 55 to 57, wherein  
R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> are hydrogen.

59. A compound according to any of claims 55 to 58, wherein  
p is an integer of from 2 to 3, and  
q is an integer of from 2 to 3.

60. A compound according to any of claims 55 to 59, wherein  
L<sup>5</sup> is a direct bond.

61. A compound according to any of claims 55 to 60, wherein  
-L<sub>3</sub>-L<sub>4</sub>-L<sub>5</sub>- is -(CH<sub>2</sub>)<sub>4</sub>-, -(CH<sub>2</sub>)<sub>5</sub>-, or -(CH<sub>2</sub>)<sub>6</sub>-.

10 62. A compound according to any of claims 55 to 59, wherein L<sup>5</sup> is an arylene, or  
heteroarylene.

63. A compound according to claim 62, wherein L<sup>5</sup> is a C<sub>8-18</sub>-arylene, or C<sub>5-18</sub>-heteroarylene.

64. A compound according to claim 63, wherein L<sup>5</sup> is a C<sub>6-10</sub>-arylene, or C<sub>5-7</sub>-heteroarylene.

65. A compound according to any of claims 55 to 59 wherein L<sup>5</sup> is -O-.

15 66. A compound according to any of claims 54 to 65, wherein  
X is a direct bond; and  
L<sup>1</sup> is a direct bond.

67. A compound according to any of claims 54 to 65, wherein  
X is a direct bond; and  
20 L<sup>1</sup> is -O-, or -N(R<sup>8</sup>)-, wherein  
R<sup>8</sup> is as defined in claim 54.

68. A compound according to any of claims 54 to 65, wherein  
X is alkylene, which may optionally be substituted with one or more substituents R<sup>28</sup>,  
R<sup>26</sup>, and R<sup>27</sup>, or a direct bond; and  
25 L<sup>1</sup> is -N(R<sup>8</sup>)-, wherein  
R<sup>8</sup> is as defined in claim 54.

69. A compound according to claim 67 or 68, wherein L<sup>1</sup> is -N(R<sup>8</sup>) -, wherein R<sup>8</sup> is hydrogen or alkyl.

70. A compound according to claim 69, wherein L<sup>1</sup> is -N(R<sup>8</sup>) -, wherein R<sup>8</sup> is hydrogen or C<sub>1-8</sub>-alkyl.

5 71. A compound according to claim 70, wherein L<sup>1</sup> is -N(R<sup>8</sup>) -, wherein R<sup>8</sup> is hydrogen.

72. A compound according to any of claims 2 to 71, wherein R<sup>1</sup> is selected from C<sub>1-8</sub>-alkyl, C<sub>2-8</sub>-alkenyl, and C<sub>2-8</sub>-alkynyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
10 R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

73. A compound according to claim 72, wherein R<sup>1</sup> is selected from C<sub>1-8</sub>-alkyl, C<sub>2-8</sub>-alkenyl, and C<sub>2-8</sub>-alkynyl, optionally substituted with one substituent R<sup>34</sup>, wherein R<sup>34</sup> is as defined in claim 2.

15 74. A compound according to claim 72, wherein R<sup>1</sup> is C<sub>1-8</sub>-alkyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

75. A compound according to claim 74, wherein  
20 R<sup>1</sup> is C<sub>1-8</sub>-alkyl, optionally substituted with one substituent R<sup>34</sup>, wherein R<sup>34</sup> is as defined in claim 2.

76. A compound according to claim 74, wherein R<sup>1</sup> is C<sub>1-3</sub>-alkyl, optionally substituted with one or more substituents R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup>, wherein  
25 R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> are as defined in claim 2.

77. A compound according to claim 76, wherein R<sup>1</sup> is C<sub>1-3</sub>-alkyl, optionally substituted with one substituent R<sup>34</sup>, wherein R<sup>34</sup> is as defined in claim 2.

78. A compound according to any of claims 72 to 77, wherein

R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-8</sub>-cycloalkyl,  
C<sub>4-8</sub>-cycloalkenyl, C<sub>3-8</sub>-heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl,  
C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio,  
5 C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-6</sub>-alkynyl,  
C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl,  
C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, C<sub>3-8</sub>-heterocyclyl-C<sub>1-6</sub>-alkyl,  
C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkynyl, C<sub>6-18</sub>-aryl, C<sub>6-18</sub>-aryloxy,  
10 C<sub>6-18</sub>-aryloxycarbonyl, C<sub>6-18</sub>-aroyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkoxy, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl,  
C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkenyl, C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkynyl, C<sub>5-18</sub>-heteroaryl,  
C<sub>5-18</sub>-heteroaryl-C<sub>1-6</sub>-alkyl, C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkenyl and  
15 C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkynyl, of which the C<sub>6-18</sub>-aryl and C<sub>5-18</sub>-heteroaryl moiety may  
optionally be substituted with one or more substituents selected from halogen,  
-C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein  
R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl,  
C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;  
or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally  
20 containing one or two further heteroatoms selected from nitrogen, oxygen  
and sulfur, and optionally containing one or two double bonds.

79. A compound according to claim 78, wherein

R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-8</sub>-cycloalkyl,  
C<sub>3-8</sub>-heterocyclyl, C<sub>6-18</sub>-aryl, and C<sub>5-18</sub>-heteroaryl, of which the C<sub>6-18</sub>-aryl and  
25 C<sub>5-18</sub>-heteroaryl moiety may optionally be substituted with one or more substituents  
selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and  
C<sub>1-6</sub>-alkyl, wherein  
R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl,  
C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;  
30 or  
R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the  
said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally  
containing one or two further heteroatoms selected from nitrogen, oxygen  
and sulfur, and optionally containing one or two double bonds.

80. A compound according to claim 79, wherein

5           R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-6</sub>-cycloalkyl, C<sub>3-8</sub>-heterocycl, C<sub>6-18</sub>-aryl, and C<sub>5-18</sub>-heteroaryl, of which the C<sub>6-18</sub>-aryl and C<sub>5-18</sub>-heteroaryl optionally may be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

10           R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

or

15           R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

81. A compound according to claim 80, wherein

20           R<sup>34</sup>, R<sup>35</sup>, and R<sup>36</sup> independently of each other are selected from C<sub>3-6</sub>-cycloalkyl, C<sub>5-6</sub>-heterocycl, C<sub>6-10</sub>-aryl, or C<sub>5-7</sub>-heteroaryl, of which the C<sub>6-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl moiety may optionally be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

25           R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

or

30           R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

82. A compound according to any of claims 78 to 81, wherein

              R<sup>52</sup> and R<sup>53</sup> are hydrogen.

83. A compound according to claim 74, wherein

30           R<sup>1</sup> is C<sub>4-8</sub>-alkyl.

84. A compound according to any of claims 2 to 71, wherein

$R^1$  is selected from  $C_{3-8}$ -cycloalkyl, and  $C_{3-8}$ -heterocyclyl optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , wherein  
 $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  are as defined in claim 2.

85. A compound according to claim 84, wherein

5        $R^1$  is selected from  $C_{5-6}$ -cycloalkyl, and  $C_{5-6}$ -heterocyclyl, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , wherein  
 $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  are as defined in claim 2.

86. A compound according to claim 85, wherein

10       $R^1$  is cyclopentyl, cyclohexyl, tetrahydropyranyl, or tetrahydrothiopyranyl, optionally substituted with one or more substituents  $R^{34}$ ,  $R^{35}$ , and  $R^{36}$ , wherein  
 $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  are as defined in claim 2.

87. A compound according to any of claims 84 to 86, wherein

15       $R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

20      C<sub>3-8</sub>-cycloalkyl, C<sub>4-8</sub>-cycloalkenyl, C<sub>3-8</sub>-heterocyclyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkoxy, C<sub>3-8</sub>-cycloalkyloxy, C<sub>3-8</sub>-cycloalkyl-C<sub>1-6</sub>-alkylthio, C<sub>3-8</sub>-cycloalkylthio, C<sub>3-8</sub>-cycloalkyl-C<sub>2-8</sub>-alkenyl, C<sub>3-8</sub>-cycloalkyl-C<sub>2-8</sub>-alkynyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>1-6</sub>-alkyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkenyl, C<sub>4-8</sub>-cycloalkenyl-C<sub>2-6</sub>-alkynyl, C<sub>3-8</sub>-heterocyclyl-C<sub>1-6</sub>-alkyl, C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkenyl, C<sub>3-8</sub>-heterocyclyl-C<sub>2-6</sub>-alkynyl, C<sub>6-18</sub>-aryl, C<sub>6-18</sub>-aryloxy, C<sub>6-18</sub>-aryloxycarbonyl, C<sub>6-18</sub>-aroyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkoxy, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkenyl, C<sub>6-18</sub>-aryl-C<sub>2-6</sub>-alkynyl, C<sub>5-18</sub>-heteroaryl, C<sub>5-18</sub>-heteroaryl-C<sub>1-6</sub>-alkyl, C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkenyl and C<sub>5-18</sub>-heteroaryl-C<sub>2-6</sub>-alkynyl, of which the C<sub>6-18</sub>-aryl and C<sub>5-18</sub>-heteroaryl moiety may optionally be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

25      R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;

30      R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;

or

$R^{52}$  and  $R^{53}$ , when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

5

88. A compound according to claim 87, wherein

$R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

10 C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl;

C<sub>5-6</sub>-cycloalkyl, C<sub>5-6</sub>-cycloalkenyl, C<sub>5-6</sub>-heterocyclyl, C<sub>5-8</sub>-cycloalkyloxy,

15 C<sub>5-6</sub>-cycloalkylthio, C<sub>6-10</sub>-aryl, C<sub>6-10</sub>-aryloxy, C<sub>6-10</sub>-aryloxycarbonyl, C<sub>6-10</sub>-aroyl, C<sub>5-7</sub>-heteroaryl, of which the C<sub>6-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl moiety may optionally be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl, wherein

15

$R^{52}$  and  $R^{53}$  independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-10</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

20 or

$R^{52}$  and  $R^{53}$ , when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

25

89. A compound according to claim 88, wherein

$R^{34}$ ,  $R^{35}$ , and  $R^{36}$  independently of each other are selected from -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup> and -C(O)OR<sup>52</sup>;

C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup> and C<sub>1-6</sub>-alkyl, wherein

$R^{52}$  and  $R^{53}$  independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-10</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-10</sub>-aryl;

or

$R^{52}$  and  $R^{53}$ , when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

90. A compound according to any of claims 87 to 89, wherein

$R^{52}$  and  $R^{53}$  are hydrogen.

10 91. A compound according to any of claims 2 to 71, wherein

$R^1$  is selected from C<sub>6-10</sub>-aryl and C<sub>5-10</sub>-heteroaryl optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ , wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as defined in claim 2.

92. A compound according to claim 91, wherein

15  $R^1$  is selected from C<sub>6-10</sub>-aryl or C<sub>5-7</sub>-heteroaryl optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ , wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as defined in claim 2.

93. A compound according to claim 92, wherein

20  $R^1$  is phenyl or pyridine optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ , wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as defined in claim 2.

94. A compound according to claim 93, wherein

25  $R^1$  is phenyl optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ , wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as defined in claim 2.

95. A compound according to claim 93, wherein

25  $R^1$  is pyridine optionally substituted with one or more substituents  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$ , wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  are as defined in claim 2.

96. A compound according to any of claims 91 to 95, wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  independently of each other are selected from halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>;

5  $C_{1-6}$ -alkyl,  $C_{2-6}$ -alkenyl and  $C_{2-6}$ -alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and

10  $C_{1-8}$ -alkyl;

$C_{3-8}$ -cycloalkyl,  $C_{4-8}$ -cycloalkenyl,  $C_{3-8}$ -heterocyclyl,  $C_{3-8}$ -cycloalkyl-C<sub>1-6</sub>-alkyl,  $C_{3-8}$ -cycloalkyl-C<sub>1-6</sub>-alkoxy,  $C_{3-8}$ -cycloalkyloxy,  $C_{3-8}$ -cycloalkyl-C<sub>1-6</sub>-alkylthio,  $C_{3-8}$ -cycloalkylthio,  $C_{3-8}$ -cycloalkyl-C<sub>2-6</sub>-alkenyl,  $C_{3-8}$ -cycloalkyl-C<sub>2-6</sub>-alkynyl,  $C_{4-8}$ -cycloalkenyl-C<sub>1-6</sub>-alkyl,  $C_{4-8}$ -cycloalkenyl-C<sub>2-6</sub>-alkenyl,

15  $C_{4-8}$ -cycloalkenyl-C<sub>2-6</sub>-alkynyl,  $C_{3-8}$ -heterocyclyl-C<sub>1-6</sub>-alkyl,  $C_{3-8}$ -heterocyclyl-C<sub>2-6</sub>-alkenyl,  $C_{3-8}$ -heterocyclyl-C<sub>2-6</sub>-alkynyl,  $C_{6-18}$ -aryl,  $C_{6-18}$ -aryloxy,  $C_{6-18}$ -aryloxycarbonyl,  $C_{6-18}$ -aroyl,  $C_{6-18}$ -aryl-C<sub>1-6</sub>-alkoxy,  $C_{6-18}$ -aryl-C<sub>1-6</sub>-alkyl,  $C_{6-18}$ -aryl-C<sub>2-6</sub>-alkenyl,  $C_{6-18}$ -aryl-C<sub>2-6</sub>-alkynyl,  $C_{5-18}$ -heteroaryl,

20  $C_{5-18}$ -heteroaryl-C<sub>1-6</sub>-alkyl,  $C_{5-18}$ -heteroaryl-C<sub>2-6</sub>-alkenyl and  $C_{5-18}$ -heteroaryl-C<sub>2-6</sub>-alkynyl, of which the  $C_{6-18}$ -aryl and  $C_{5-18}$ -heteroaryl optionally may be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and  $C_{1-6}$ -alkyl;

25 or two of  $R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  on adjacent carbon atoms may independently be taken together to form -O-CH<sub>2</sub>-O-, wherein

$R^{52}$  and  $R^{53}$  independently of each other are hydrogen,  $C_{1-6}$ -alkyl,  $C_{6-18}$ -aryl- $C_{1-6}$ -alkyl or  $C_{6-18}$ -aryl;

or

$R^{52}$  and  $R^{53}$ , when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

97. A compound according to claim 96, wherein

$R^{44}$ ,  $R^{45}$ ,  $R^{46}$ , and  $R^{47}$  independently of each other are selected from

halogen, -CN, -CH<sub>2</sub>CN, -CHF<sub>2</sub>, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OCHF<sub>2</sub>, -OCH<sub>2</sub>CF<sub>3</sub>, -OCF<sub>2</sub>CHF<sub>2</sub>, -S(O)<sub>2</sub>CF<sub>3</sub>, -SCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, -SR<sup>52</sup>, -NR<sup>52</sup>S(O)<sub>2</sub>R<sup>53</sup>, -S(O)<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -S(O)NR<sup>52</sup>R<sup>53</sup>, -S(O)R<sup>52</sup>, -S(O)<sub>2</sub>R<sup>52</sup>, -C(O)NR<sup>52</sup>R<sup>53</sup>, -OC(O)NR<sup>52</sup>R<sup>53</sup>, -NR<sup>52</sup>C(O)R<sup>53</sup>, -CH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -OCH<sub>2</sub>C(O)NR<sup>52</sup>R<sup>53</sup>, -CH<sub>2</sub>OR<sup>52</sup>, -CH<sub>2</sub>NR<sup>52</sup>R<sup>53</sup>, -OC(O)R<sup>52</sup>, -C(O)R<sup>52</sup>, and -C(O)OR<sup>52</sup>;

- 5 C<sub>1-6</sub>-alkyl, C<sub>2-6</sub>-alkenyl and C<sub>2-6</sub>-alkynyl, which may optionally be substituted with one or more substituents selected from -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;
- 10 C<sub>5-6</sub>-cycloalkyl, C<sub>5-6</sub>-heterocyclyl, C<sub>5-6</sub>-cycloalkyloxy, C<sub>5-6</sub>-cycloalkylthio, C<sub>6-10</sub>-aryl, C<sub>6-10</sub>-aryloxy, C<sub>6-10</sub>-aryloxycarbonyl, C<sub>6-10</sub>-aroyl, C<sub>5-7</sub>-heteroaryl, of which the C<sub>6-10</sub>-aryl and C<sub>5-7</sub>-heteroaryl moieties may optionally be substituted with one or more substituents selected from halogen, -C(O)OR<sup>52</sup>, -CN, -CF<sub>3</sub>, -OCF<sub>3</sub>, -NO<sub>2</sub>, -OR<sup>52</sup>, -NR<sup>52</sup>R<sup>53</sup>, and C<sub>1-6</sub>-alkyl;
- 15 or
- two of R<sup>44</sup>, R<sup>45</sup>, R<sup>46</sup>, and R<sup>47</sup> on adjacent carbon atoms may independently be taken together to form -O-CH<sub>2</sub>-O-;

wherein R<sup>52</sup> and R<sup>53</sup> independently of each other are hydrogen, C<sub>1-6</sub>-alkyl, C<sub>6-18</sub>-aryl-C<sub>1-6</sub>-alkyl or C<sub>6-18</sub>-aryl;

- 20 or R<sup>52</sup> and R<sup>53</sup>, when attached to the same nitrogen atom, together with the said nitrogen atom may form a 3 to 8 membered heterocyclic ring optionally containing one or two further heteroatoms selected from nitrogen, oxygen and sulfur, and optionally containing one or two double bonds.

25 98. A compound according to claim 96 or claim 97, wherein

R<sup>52</sup> and R<sup>53</sup> are hydrogen.

99. A compound according to any of claims 2 to 98, wherein

R<sup>4</sup> is hydrogen or alkyl.

100. A compound according to claim 99, wherein

30 R<sup>4</sup> is hydrogen or C<sub>1-6</sub>-alkyl.

101. A compound according to claim 100, wherein

R<sup>4</sup> is hydrogen.

102. A compound according to any of claims 2 to 101, wherein

R<sup>5</sup> is heteroaryl, optionally substituted with one or more substituents R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup>, wherein

R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> are as defined in claim 2.

5 103. A compound according to claim 102, wherein

R<sup>5</sup> is a five or six membered heteroaryl, optionally substituted with one or more substituents R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup>, wherein

R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> are as defined in claim 2.

104. A compound according to claim 103, wherein

10 R<sup>5</sup> is selected from the group consisting of furan, thiophene, pyrrole, imidazole, pyrazole, triazole, tetrazole, thiazole, oxazole, isoxazole, oxadiazole, thiadiazole, isothiazole, pyridine, pyridazine, pyrazine, pyrimidine, quinoline, isoquinoline, benzofuran, benzothiophene, indole, and indazole; optionally substituted with one or more substituents R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup>, wherein

15 R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> are as defined in claim 2.

105. A compound according to any of claims 102 to 104, wherein

R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> independently of each other are selected from halogen, perfluoroalkyl, cyano, alkyl-Z-, aryl-alkylene-Z-, and R<sup>65</sup>-W-alkylene-Z-; wherein

Z and W independently of each other are selected from a direct bond, -O-,

20 -N(R<sup>66</sup>)-, -N(R<sup>66</sup>)C(O)-, and -OC(O)-; wherein

R<sup>66</sup> is hydrogen or alkyl; and

R<sup>65</sup> is hydrogen or alkyl.

106. A compound according to claim 105, wherein

25 R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> independently of each other are selected from the group consisting of halogen, perfluoroalkyl, cyano, alkyl-OC(O)-alkylene-, alkyl-NHC(O)-alkylene-, N(alkyl)<sub>2</sub>C(O)-alkylene-, alkyl-OC(O)-, NH(alkyl)-C(O)-, N(alkyl)<sub>2</sub>C(O)-, aryl-alkylene-O-, and aryl-alkylene-NH-.

107. A compound according to claim 106, wherein

30 R<sup>48</sup>, R<sup>49</sup>, R<sup>50</sup>, and R<sup>51</sup> independently of each other are selected from the group consisting of halogen, perfluoro-C<sub>1-8</sub>-alkyl, cyano, C<sub>1-8</sub>-alkyl-OC(O)-C<sub>1-8</sub>-alkylene-, C<sub>1-8</sub>-alkyl-NHC(O)-C<sub>1-8</sub>-alkylene-, N(C<sub>1-8</sub>-alkyl)<sub>2</sub>C(O)-C<sub>1-8</sub>-alkylene-,

$C_{1-8}$ -alkyl-OC(O)-, NH( $C_{1-8}$ -alkyl)-C(O)-, N( $C_{1-8}$ -alkyl)<sub>2</sub>-C(O)-,  
 $C_{6-18}$ -aryl- $C_{1-8}$ -alkylene-O-, and  $C_{6-18}$ -aryl- $C_{1-8}$ -alkylene-NH-.

108. A compound according to claim 104, wherein

5            $R^5$  is selected from the group consisting of thiazole, thiadiazole, isothiazole,  
pyridine, and pyrimidine; optionally substituted with one or more substituents  $R^{48}$ ,  
 $R^{49}$ ,  $R^{50}$ , and  $R^{51}$ , wherein  
 $R^{48}$ ,  $R^{49}$ ,  $R^{50}$ , and  $R^{51}$  are as defined in claim 2.

109. A compound according to claim 108, wherein

10            $R^{48}$ ,  $R^{49}$ ,  $R^{50}$ , and  $R^{51}$  independently of each other are selected from halogen,  
perfluoroalkyl, cyano, alkyl-Z-, aryl-alkylene-Z-, and  $R^{65}$ -W-alkylene-Z-; wherein  
Z and W independently of each other are selected from a direct bond, -O-,  
-N( $R^{66}$ )-, -N( $R^{66}$ )C(O)-, and -OC(O)-; wherein  
 $R^{66}$  is hydrogen or alkyl; and  
 $R^{65}$  is hydrogen or alkyl.

15           110. A compound according to claim 109, wherein

$R^{48}$ ,  $R^{49}$ ,  $R^{50}$ , and  $R^{51}$  independently of each other are selected from the group  
consisting of halogen, perfluoroalkyl, cyano, alkyl-OC(O)-alkylene-,  
alkyl-NHC(O)-alkylene-, N(alkyl)<sub>2</sub>C(O)-alkylene-, alkyl-OC(O)-, NH(alkyl)-C(O)-,  
N(alkyl)<sub>2</sub>C(O)-, aryl-alkylene-O-, and aryl-alkylene-NH-.

20           111. A compound according to claim 110, wherein

$R^{48}$ ,  $R^{49}$ ,  $R^{50}$ , and  $R^{51}$  independently of each other are selected from the group  
consisting of halogen, perfluoro- $C_{1-8}$ -alkyl, cyano,  $C_{1-8}$ -alkyl-OC(O)- $C_{1-8}$ -alkylene-,  
 $C_{1-8}$ -alkyl-NHC(O)- $C_{1-8}$ -alkylene-, N( $C_{1-8}$ -alkyl)<sub>2</sub>C(O)- $C_{1-8}$ -alkylene-,  
 $C_{1-8}$ -alkyl-OC(O)-, NH( $C_{1-8}$ -alkyl)-C(O)-, N( $C_{1-8}$ -alkyl)<sub>2</sub>C(O)-,  $C_{6-18}$ -aryl- $C_{1-8}$ -alkylene-  
O-, and  $C_{6-18}$ -aryl- $C_{1-8}$ -alkylene-NH-.

112. A compound according to any of claims 2 to 111, wherein

G is -C(O)-.

113. A compound according to any of claims 1 to 112, which compound is an activator of  
glucokinase, when tested in the Glucokinase Activation Assay (I) disclosed herein.

114. A compound according to any of claims 1 to 112, which compound, at a concentration of 30  $\mu$ M, is capable of providing an at least 1.3 fold activation of glucokinase in the Glucokinase Activation Assay (I) disclosed herein.

115. A carboxamide or sulfonamide compound having a heteroatom in the alpha, beta, or  
5 gamma position relative to the carboxamide or sulfonamide, respectively, which compound,  
at a concentration of 30  $\mu$ M, is capable of providing an at least 1.3 fold activation of  
glucokinase in the Glucokinase Activation Assay (I) disclosed herein.

116. A compound according to claim 114 or claim 115, which compound, at a concentration  
of 30  $\mu$ M, is capable of providing an at least 1.5, such as at least 1.7, for instance at least 2.0  
10 fold activation of glucokinase in the Glucokinase Activation Assay (I) disclosed herein.

117. A compound according to any of claims 1 to 112, which compound, at a concentration  
of 5  $\mu$ M, is capable of providing an at least 1.3 fold activation of glucokinase in the  
Glucokinase Activation Assay (I) disclosed herein.

118. A carboxamide or sulfonamide compound having a heteroatom in the alpha, beta, or  
15 gamma position relative to the carboxamide or sulfonamide, respectively, which compound,  
at a concentration of 5  $\mu$ M, is capable of providing an at least 1.3 fold activation of  
glucokinase in the Glucokinase Activation Assay (I) disclosed herein.

119. A compound according to claim 117 or claim 118, which at a concentration of 5  $\mu$ M is  
capable of providing an at least 1.5, such as at least 1.7, for instance at least 2.0 fold  
20 activation of glucokinase in the Glucokinase Activation Assay (I) disclosed herein.

120. A compound according to any one of claims 1 to 119, which is an agent useful for the  
treatment of an indication selected from the group consisting of hyperglycemia, IGT, type 2  
diabetes, type 1 diabetes, dyslipidemia, hypertension, and obesity.

121. A compound according to claim 1 or claim 2, which is  
25 2-(3,4-dichlorophenoxy)-hexanoic acid thiazol-2-yl amide,  
2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-methoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-methoxyphenoxy)-N-pyridin-2-ylhexanamide,  
2-(3,4-dichlorophenoxy)-4-methyl-N-1,3-thiazol-2-ylpentanamide,

- 2-(1,1'-biphenyl-4-yloxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-isopropylphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(3-methoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(2,3-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
5 2-(3,4-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(3,5-dimethoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(2-naphthyoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(2,4-difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(3,4-difluorophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
10 2-(1,3-benzodioxol-5-yloxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-methylsulfonylphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(2,4,6-trichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(2,4-dichlorophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-phenoxyphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
15 2-(4-cyanophenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-chloro-3-trifluoromethylphenoxy)-N-1,3-thiazol-2-ylhexanamide,  
2-(4-methoxyphenoxy)-N-1,3-thiazol-2-ylheptanamide,  
2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylheptanamide,  
2-(3,4-dichlorophenoxy)-3-cyclopentyl-N-1,3-thiazol-2-ylpropionamide,  
20 2-(4-methoxyphenoxy)-3-cyclopentyl-N-1,3-thiazol-2-ylpropionamide,  
2-(4-chloro-phenylsulfanyl)-hexanoic acid thiazol-2-ylamide,  
2-(4-chloro-phenylsulfanyl)-hexanoic acid pyridin-2-ylamide,  
2-(indolin-1-yl)-N-(1,3-thiazol-2-yl)hexanamide,  
3-(4-chlorophenyl)-N-pyridin-2-yl-3-(tetrahydro-2H-thiopyran-4-ylamino)propanamide,  
25 3-(4-chlorophenyl)-3-(tetrahydro-2H-thiopyran-4-ylamino)-N-1,3-thiazol-2-ylpropanamide,  
2-(3,4-dichlorobenzyloxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide,  
2-(3,4-dichlorobenzyloxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide,  
2-(4-chlorophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide,  
2-(4-chlorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide,  
30 2-(4-bromophenoxy)-2-(4-chlorophenyl)-N-pyridin-2-ylacetamide,  
2-(4-bromophenoxy)-2-(4-chlorophenyl)-N-1,3-thiazol-2-ylacetamide,  
2-(4-chlorophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide,  
2-(4-chlorophenyl)-2-(3,4-dichlorophenoxy)-N-pyridin-2-ylacetamide,  
2-(4-bromophenoxy)-2-(4-bromophenyl)-N-pyridin-2-ylacetamide,  
35 2-(4-bromophenoxy)-2-(4-bromophenyl)-N-1,3-thiazol-2-ylacetamide,  
2-(4-bromophenyl)-2-(4-methylphenoxy)-N-pyridin-2-ylacetamide,

- 2-(4-bromophenyl)-2-(4-fluorophenoxy)-N-1,3-thiazol-2-ylacetamide,  
2-(4-bromophenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide,  
2-(4-fluorophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide,  
2-(4-fluorophenoxy)-2-(4-fluorophenyl)-N-1,3-thiazol-2-ylacetamide,  
5 2-(4-fluorophenyl)-2-(4-methylphenoxy)-N-1,3-thiazol-2-ylacetamide,  
2-(4-fluorophenyl)-2-phenoxy-N-1,3-thiazol-2-ylacetamide,  
2-(4-bromophenoxy)-2-(4-fluorophenyl)-N-pyridin-2-ylacetamide,  
2-(4-fluorophenoxy)-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide,  
2-(4-bromophenoxy)-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide,  
10 2-(3,4-dichlorophenoxy)-2-(3,4-dichlorophenyl)-N-1,3-thiazol-2-ylacetamide,  
2-cyclopentylsulfanyl-2-phenyl-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-phenyl-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-fluorophenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-fluorophenyl)-N-pyridin-2-yl-acetamide,  
15 2-cyclopentylsulfanyl-2-(3-chlorophenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-chlorophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-chlorophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-bromophenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-bromophenyl)-N-pyridin-2-yl-acetamide,  
20 2-cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-methoxyphenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-cyanophenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-cyanophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-cyanophenyl)-N-1,3-thiazol-2-yl-acetamide,  
25 2-cyclopentylsulfanyl-2-(4-cyanophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-nitrophenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-nitrophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-methylsulfonyl)phenyl-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-methylsulfonyl)phenyl-N-pyridin-2-yl-acetamide,  
30 2-cyclopentylsulfanyl-2-(4-trifluoromethyl)phenyl-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-trifluoromethyl)phenyl-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-1,3-thiazol-2-yl-acetamide,  
35 2-cyclopentylsulfanyl-2-(4-trifluoromethoxyphenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-1,3-thiazol-2-yl-acetamide,

- 2-cyclopentylsulfanyl-2-(4-phenyl)phenyl-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(4-phenoxyphenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3,4-difluorophenyl)-N-1, 3-thiazol-2-yl-acetamide,  
5 2-cyclopentylsulfanyl-2-(3, 4-difluorophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3,5-difluorophenyl)-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3, 5-difluorophenyl)-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-{3,4-(methylenedioxy)phenyl}-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-{3,4-(methylenedioxy)phenyl}-N-pyridin-2-yl-acetamide,  
10 2-cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-[3,5-bis(trifluoromethyl)phenyl]-N-pyridin-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3-chloro-4-methoxy)phenyl-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-thiazol-2-yl-acetamide,  
N-(5-bromo-1,3-thiazol-2-yl)-2-(cyclopentylthio)-2-(3,4-dichlorophenyl)acetamide,  
15 2-cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methoxycarbonylmethyl)-1, 3-thiazol-2-yl]-  
acetamide,  
2-cyclopentylsulfanyl-2-(3,4-dichlorophenyl)-N-[(4-methylaminocarbonylmethyl)-1, 3-thiazol-  
2-yl]-acetamide,  
2-(cyclopentylthio)-2-(3,4-dichlorophenyl)-N-1,3,4-thiadiazol-2-ylacetamide,  
20 2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyridinyl-2-yl-acetamide,  
2-cyclopentylsulfanyl-2-(3,4-dichloro-phenyl)-N-pyrimidin-2-yl-acetamide,  
2-cyclohexylsulfanyl-2-(3,4-dichlorophenyl)-N-1, 3-thiazol-2-yl-acetamide,  
2-cyclohexylsulfanyl-2-(3, 4-dichlorophenyl)-N-pyridin-2-yl-acetamide,  
2-isopropylsulfanyl-2-(3,4-dichlorophenyl)-N-1, 3-thiazol-2-yl-acetamide,  
25 2-isopropylsulfanyl-2-(3, 4-dichlorophenyl)-N-pyridin-2-yl-acetamide,  
2-allylsulfanyl-2-(3,4-dichlorophenyl)-N-1, 3-thiazol-2-yl-acetamide,  
2-(3,4-dichlorophenyl)-2-(isobutylthio)-N-pyridin-2-ylacetamide,  
2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-pyridin-2-ylacetamide,  
2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-1,3-thiazol-2-ylacetamide,  
30 2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-1,3-thiazol-2-ylacetamide,  
2-(4-methylthio)-2-phenyl-N-pyridin-2-ylacetamide,  
2-(3,4-dichlorophenyl)-2-[(2-furylmethyl)thio]-N-pyridin-2-ylacetamide,  
2-[(4-fluorophenyl)thio]-N-pyridin-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide,  
2-[(4-fluorophenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide,  
35 2-[(4-methylphenyl)thio]-N-1,3-thiazol-2-yl-2-[4-(trifluoromethyl)phenyl]acetamide,  
2-(4-fluorophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide,

- 2-(4-bromophenyl)-2-[(4-fluorophenyl)thio]-N-pyridin-2-ylacetamide,  
2-(4-bromophenyl)-2-[(4-methylphenyl)thio]-N-pyridin-2-ylacetamide,  
N-[1-(4-chlorophenyl)cyclopentyl]-N'-1,3-thiazol-2-ylurea,  
N-[1-(4-chlorophenyl)cyclopentyl]-N'-pyridin-2-ylurea,  
5 N-[1-(4-chlorophenyl)cyclohexyl]-N'-1,3-thiazol-2-ylurea,  
N-[1-(4-chlorophenyl)cyclohexyl]-N'-pyridin-2-ylurea,  
1-(3-benzyloxyphenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorophenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
1-(4-fluorophenyl)-1-*n*-pentyl-3-(thiazol-2-yl)urea,  
10 1-(3,4-methylenedioxybenzyl)-1-(3,4-dichlorobenzyl)-3-(thiazol-2-yl)urea,  
1-(4-fluorophenyl)-1-cyclopentyl-3-(thiazol-2-yl)urea,  
.1-(3,4-dichlorobenzyl)-1-[ethyl-(2-thiophene)]-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorobenzyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
1-(4-fluorophenyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea,  
15 1-(3-chlorophenethyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
1-(2-ethoxybenzyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
1-(4-fluorophenyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorobenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea,  
1-(3-methylpyridine)-1-(cyclohexylmethyl)-3-(thiazol-2-yl)urea,  
20 1-(2-ethoxybenzyl)-1-cyclohexylmethyl-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorobenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea,  
1-(2-ethoxybenzyl)-1-cyclopentyl-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorobenzyl)-1-(4-tetrahydropyranyl)-3-(thiazol-2-yl)urea,  
1-(3,4-dichlorobenzyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea,  
25 1-(3-chlorophenethyl)-1-(4-tetrahydrothiopyranyl)-3-(thiazol-2-yl)urea,  
1-(4-fluorophenyl)-1-*i*-butyl-3-(thiazol-2-yl)urea,  
2-cyclopentyl-1-(3,4-dichlorophenyl)ethyl pyridin-2-ylcarbamate,  
2-cyclopentyl-1-(3,4-dichlorophenyl)ethyl 1,3-thiazol-2-ylcarbamate,  
(2-[3-cyclohexyl-2-(4-methoxyphenoxy)propionylamino]thiazol-4-yl) acetic acid,  
30 1-cyclopentylmethyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea,  
1-cyclopentyl-1-(3,4-dichloro-phenyl)-3-thiazol-2-yl-urea, or  
1-(3,4-dichloro-phenyl)-1-propyl-3-thiazol-2-yl-urea.

122. A compound according to any one of claims 1 to 121 for use as a medicament.

123. A compound according to any one of claims 1 to 121 for treatment of hyperglycemia, for treatment of IGT, for treatment of Syndrome X, for treatment of type 2 diabetes, for treatment of type 1 diabetes, for treatment of dyslipidemia or hyperlipidemia, for treatment of hypertension, for the treatment or prophylaxis of obesity, for lowering of food intake, for

5 appetite regulation, for regulating feeding behaviour, for enhancing the secretion of enteroincretins, such as GLP-1.

124. A pharmaceutical composition comprising, as an active ingredient, at least one compound according to any one of claims 1 to 123 together with one or more pharmaceutically acceptable carriers or excipients.

10 125. A pharmaceutical composition according to claim 124 in unit dosage form, comprising from about 0.05 mg to about 1000 mg, preferably from about 0.1 mg to about 500 mg and especially preferred from about 0.5 mg to about 200 mg of the compound according to any one of claims 1 to 123.

15 126. A pharmaceutical composition according to claim 124 or claim 125 comprising a further antidiabetic agent.

127. A pharmaceutical composition according to claim 126, wherein said further antidiabetic agent is insulin or an insulin analogue, a sulphonylurea, a biguanide, a meglitinide, an insulin sensitizer, a thiazolidinedione insulin sensitizer, an  $\alpha$ -glucosidase inhibitor, a glycogen phosphorylase inhibitor, or an agent acting on the ATP-dependent potassium channel of the  
20 pancreatic  $\beta$ -cells.

128. A pharmaceutical composition according to any of claims 124 to 127 comprising a further antihyperlipidemic agent.

129. A pharmaceutical composition according to claim 128, wherein said further antihyperlipidemic agent is cholestyramine, colestipol, clofibrate, gemfibrozil, lovastatin,  
25 pravastatin, simvastatin, probucol or dextrothyroxine.

130. A pharmaceutical composition according to any of claims 124 to 128 comprising a further antiobesity or appetite regulating agent.

131. A pharmaceutical composition according to any of claims 124 to 130 comprising a further antihypertensive agent.

132. Use of a compound according to any of claims 1 to 123 for increasing the activity of glucokinase.

5 133. Use of a compound according to any one of claims 1 to 123 for the treatment of hyperglycemia, IGT, Syndrome X, type 2 diabetes, type 1 diabetes, dyslipidemia, hyperlipidemia, hypertension.

134. Use of a compound according to any one of claims 1 to 123 for lowering of food intake.

135. Use of a compound according to any one of claims 1 to 123 for appetite regulation.

10 136. Use of a compound according to any one of claims 1 to 123 for the treatment or prophylaxis of obesity.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/DK 02/00880

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K31/426 A61K31/4402 A61K31/505 A61P3/04 A61P3/10  
C07D277/46 C07D417/12 C07D213/75 C07D409/12 C07D239/42  
C07D405/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, BEILSTEIN Data, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 02 08209 A (HOFFMANN LA ROCHE) 31 January 2002 (2002-01-31) page 45; claim 1; example 10 ---	2-112, 122-136
X	DE 21 51 766 A (SCHERING AG) 19 April 1973 (1973-04-19) claim 1 ---	2
X	DE 22 64 983 A (SCHERING AG) 16 October 1975 (1975-10-16) claim 1 ---	2
Y	WO 01 85706 A (HOFFMANN LA ROCHE) 15 November 2001 (2001-11-15) claim 1 ---	2-112, 122-136
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed Invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed Invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the International search	Date of mailing of the International search report
26 February 2003	11/03/2003
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Fax: (+31-70) 340-3016	Authorized officer  Gettins, M

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/DK 02/00880

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 01 85707 A (HOFFMANN LA ROCHE) 15 November 2001 (2001-11-15) cited in the application claim 1 ----	2-112, 122-136
Y	WO 01 83465 A (HOFFMANN LA ROCHE) 8 November 2001 (2001-11-08) cited in the application claim 1 ----	2-112, 122-136
Y	WO 00 58293 A (HOFFMANN LA ROCHE) 5 October 2000 (2000-10-05) cited in the application claim 1 -----	2-112, 122-136

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/DK 02/00880

### Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:  

Although claims 132-136 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2.  Claims Nos.: 1,113-120 because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  

see FURTHER INFORMATION sheet PCT/ISA/210
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple Inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the Invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1,113-120

Present claim 1 relates to compounds defined by reference to a desirable characteristic or property, namely that they are activators of glucokinase. The reference to carboxamide or sulfonamide is insufficient to characterise the compounds in structural terms. Claim 1 is not searchable. Similarly claims 113-120 refer to compounds which are only defined in terms of their ability to activate glucokinase. There is no indication whatsoever as to to their structure.

The claims 113-120 covers all compounds having this characteristic or property, whereas the application provides support within the meaning of Article 6 PCT and/or disclosure within the meaning of Article 5 PCT for only a very limited number of such compounds. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Independent of the above reasoning, the claims also lack clarity (Article 6 PCT). An attempt is made to define the compounds by reference to a result to be achieved. Again, this lack of clarity in the present case is such as to render a meaningful search over the whole of the claimed scope impossible.

Present claims 2-112 and 122-136 relate to an extremely large number of possible compounds. Support within the meaning of Article 6 PCT and/or disclosure within the meaning of Article 5 EPC is to be found, however, for only a very small proportion of the compounds claimed. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Consequently, the search has been carried out for those parts of the claims which appear to be supported and disclosed, namely those parts relating to the compounds defined in the examples and claim 121. Claims 2-112 and 122-136 have only been searched in so far as they are the same as claim 121.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DK 02/00880

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 0208209	A	31-01-2002		AU 8760001 A WO 0208209 A1 US 2002198200 A1 US 2002042512 A1	05-02-2002 31-01-2002 26-12-2002 11-04-2002
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